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Plastics

EALING WITH THE MANUFACTURE, USES AND POTENTIALITIES OF PLASTIC MATERIALS

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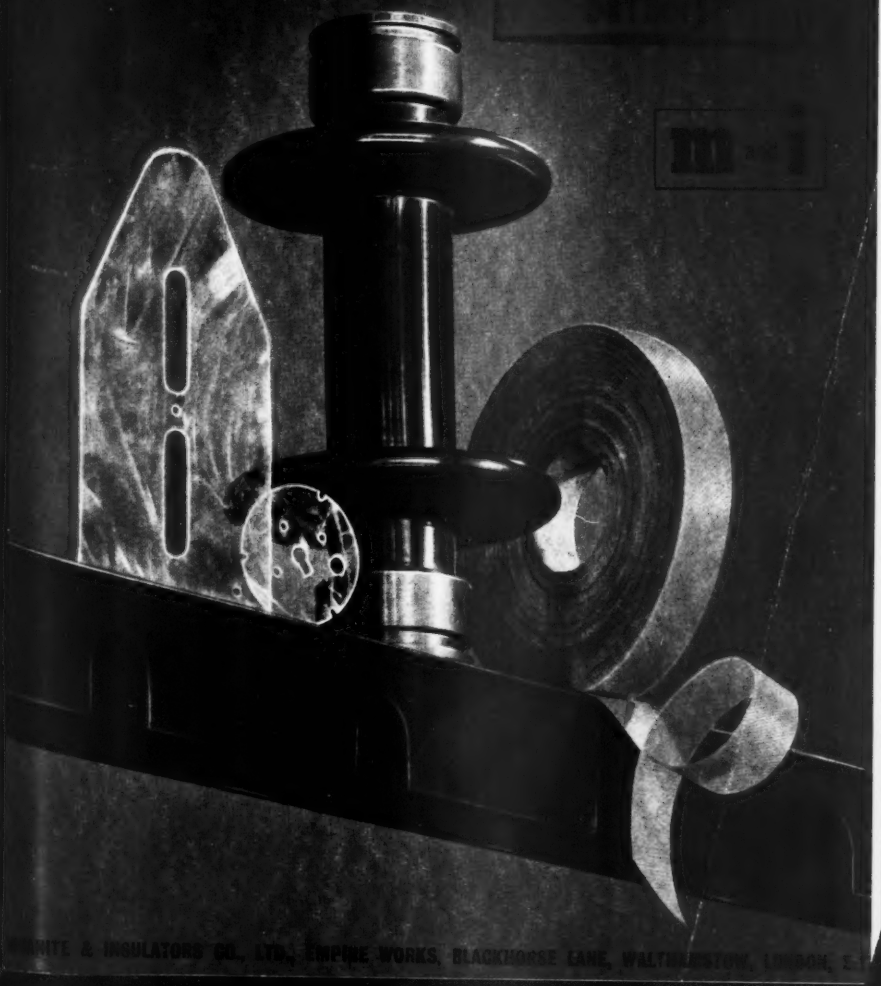

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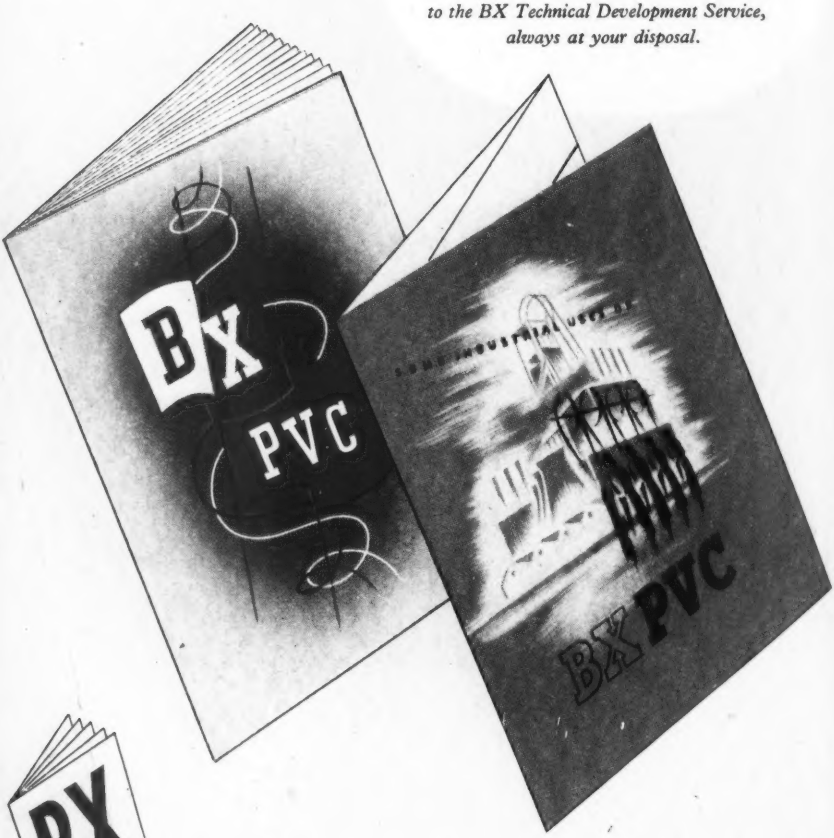

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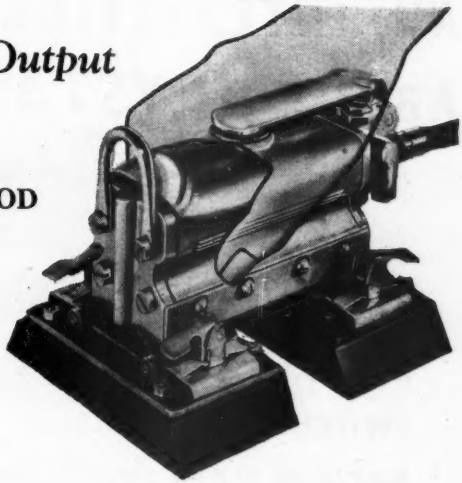

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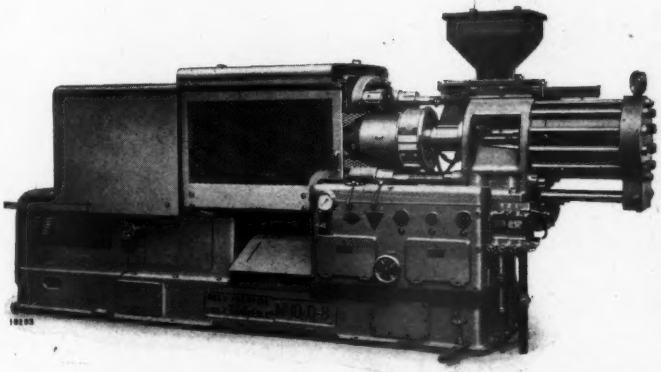

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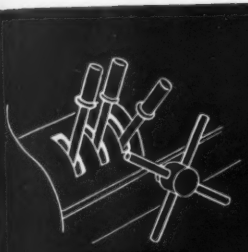
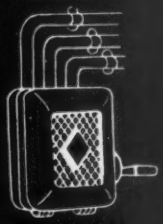
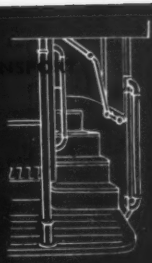

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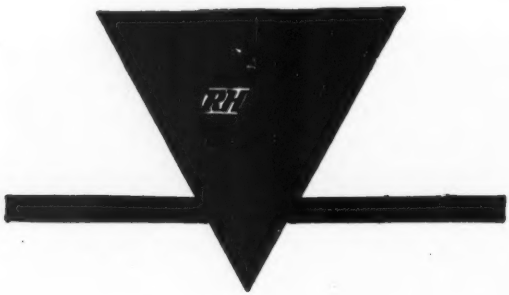

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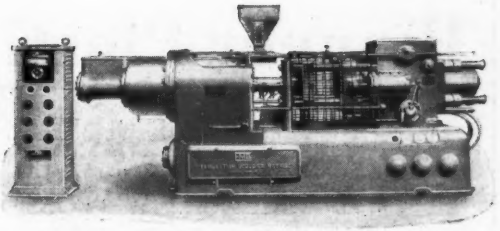

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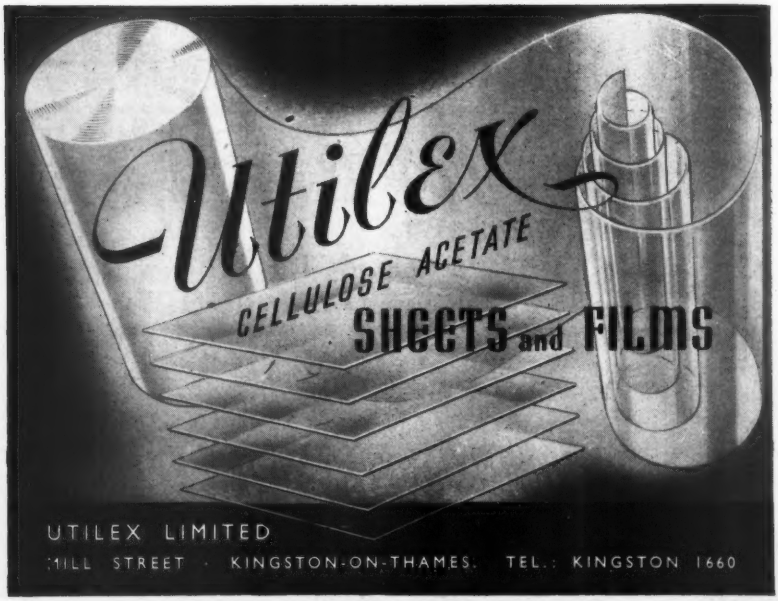
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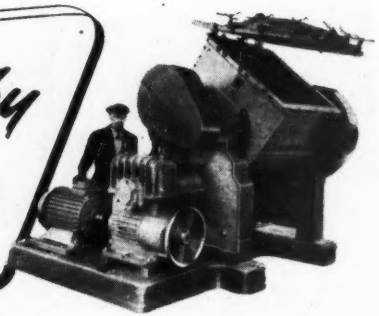

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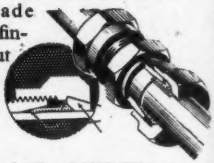

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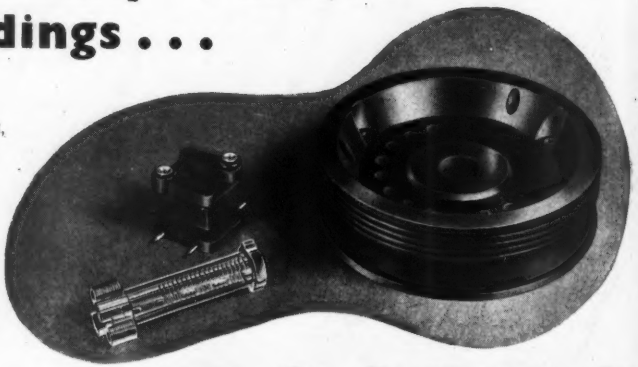

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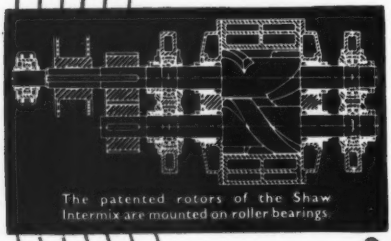

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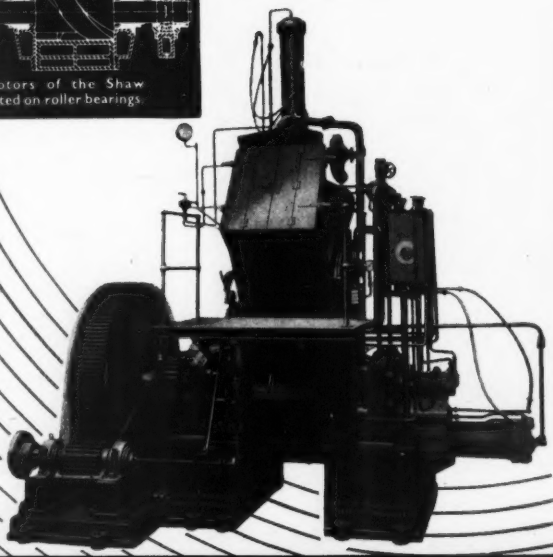

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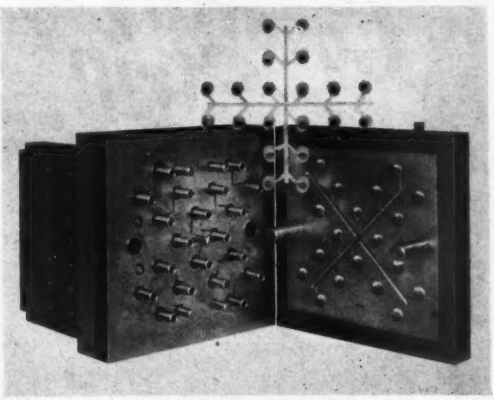

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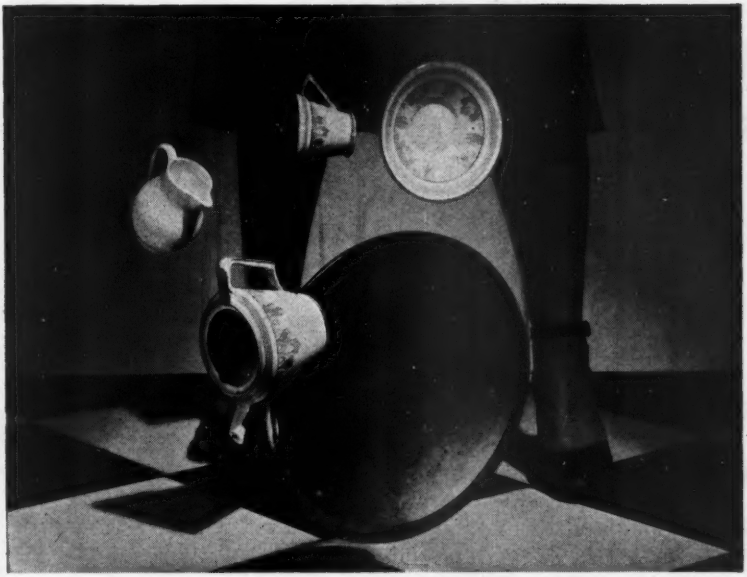

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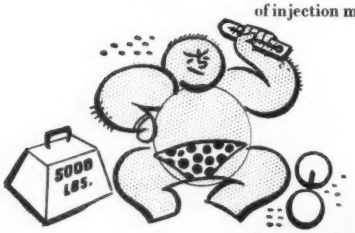

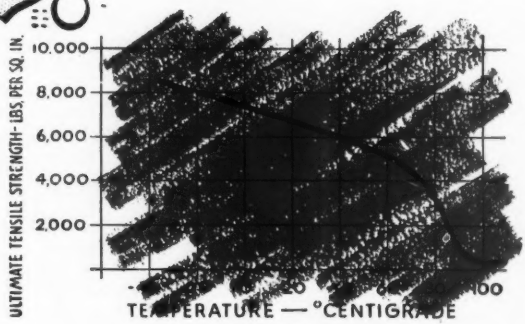

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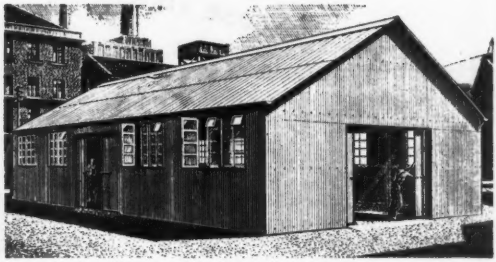

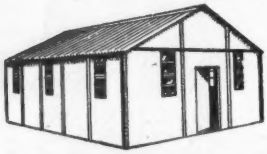

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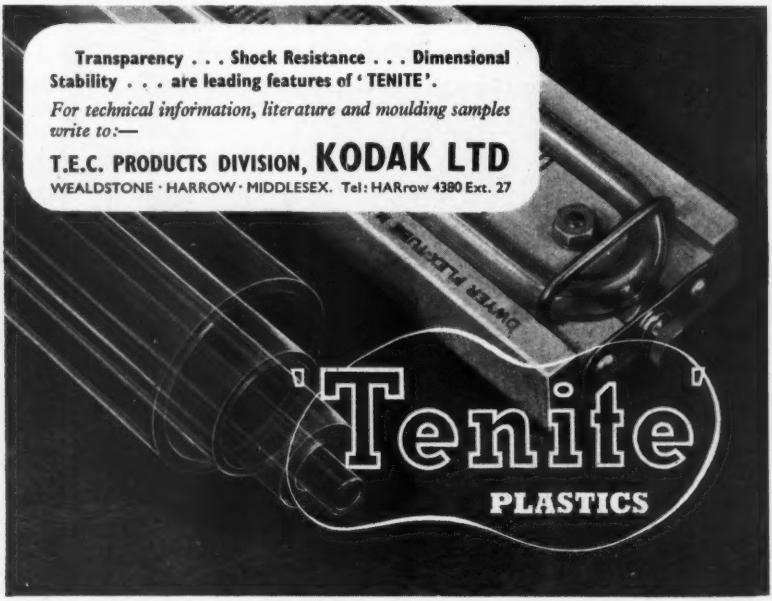

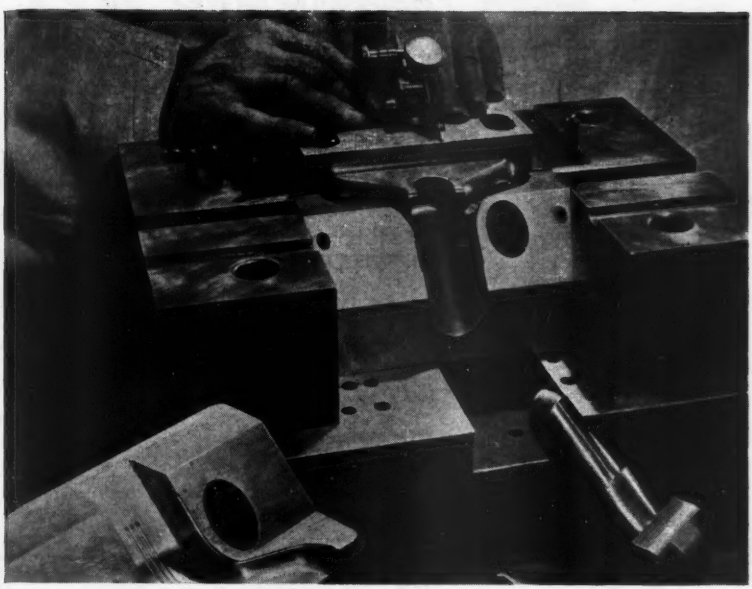

We show the sections of an injection tool for moulding a vacuum-cleaner nozzle in thermo-plastic material ; a coring piece is being checked for true alignment during assembly. As the press opens, this part is automatically withdrawn, the moulding then being free to hinge out on the fulcrum of the round coring piece shown in the foreground.

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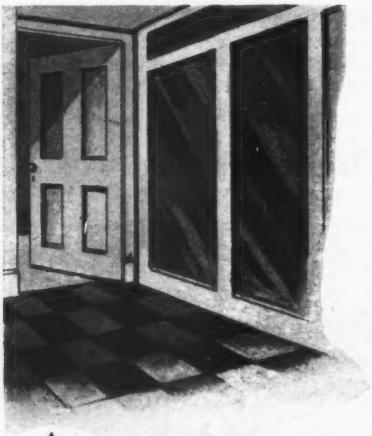

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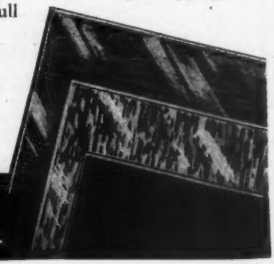

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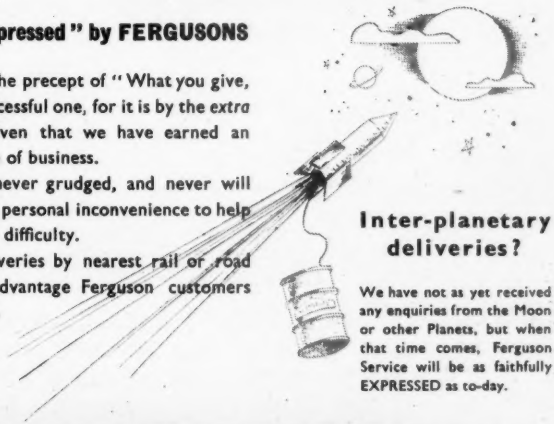

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Vol. XIII. No. 144. MAY, 1949

Plastics

Dealing with the Manufacture, Uses and Potentialities of Plastic Materials

Proprietors - - **TEMPLE PRESS LIMITED**
Chairman and Managing Director **ROLAND E. DANGERFIELD**

Editor - - - **M. D. CURWEN, B.Sc., A.R.I.C.**
Offices - - **Bowling Green Lane, London, E.C.1**

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NOTICES

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"The resin called Cahuchu in the countries of the Province of Quito near the ocean, is also very common at the bank of the Maraon. When it is fresh it can be moulded into any desired shape, it is impenetrable by rain but, what makes it still more remarkable, very elastic. Bottles are made of it which are unbreakable, shoes, hollow balls which flatten out when pressed, and assume their shape again when released. The Portuguese of Para have learned from the Omaguas how to make syringes out of the material which need no piston; they have the shape of hollow pears pierced by a small hole at one end where a small tube is fastened to it. They are filled with water and, when pressed, function like any ordinary syringe. This implement is much used by the Omaguas. When they congregate for a festival the polite host does not fail to give one to each of his guests as a present, and they always use it before taking their ceremonial meal."

From: C. M. de la Condamine's "A Voyage into the Interior of South America." Read at a public meeting of l'Acadamie des Sciences, Paris, 1745.

EDITORIALS

The Fair at its Fairest

THESE notes have been written on the third day of the B.I.F., so that readers will not expect us to make any assessment as to what business was like.

But we can remark on the stands themselves: there is every cause for congratulations and admiration. Our criticism of the 1948 Fair no longer holds for 1949. With very few exceptions not only is the design of stands vastly improved, but we can see the wood because of the more widely spaced trees.

For the raw material manufacturers there is generally little difficulty. For the moulder, who, after all, can mould anything from a motorcar facia board or radio cabinet to a toy mouth organ or flower bowl, it is difficult to know where to stop. We prefer the few choice specimens which give the visitor a clear view of the capabilities of the manufacturer. We admit, however, that this is only a matter of opinion and that some buyers, especially those with limited knowledge of the industry, want to see the object they want on the stand and to handle it. It is therefore with great pleasure that we pass on this message to the plastics industry from every visitor to this journal's stand—"It is magnificent!" We think it is thoroughly deserved.

There were visitors in plenty and inquiries were good, far more, in fact, than in 1948, and especially noteworthy in the p.v.c. sheeting, toys, fabricating, packaging and fancy goods sections. Industrial mouldings are never sold "on sight," but judging from the opinions of every overseas visitor to this stand, which related to the greater range of raw materials, improved quality of finished and half-finished goods, designs and ideas, there is room for a good deal of confidence this year.

And to speed us further on our way, what greater fillip could we have had on that Tuesday when the Queen, the seemingly tireless Queen Mary, Princess Elizabeth and the Duke of Edinburgh, saw and praised what we have been working for these many years? We don't say that the tough buyers from the four corners ran berserk and ordered millions of razors and billions of fountain pens as a consequence, but things warmed and it all cheered us up no end.

Our own Stand was a small replica of the industry and acted as a clearing house

for all problems. We were happy enough to guide a large number of visitors into the proper channels.

Industrial Productivity

THE first report of the Committee on Industrial Productivity has now been published (H.M. Stationery Office, price 6d.). Under the chairmanship of Sir Henry Tizard, G.C.B., F.R.S., the Committee has worked to advise on the form and scale of research effort in the natural and social sciences which would best assist an early increase in industrial productivity.

The term "productivity" is taken to mean not only accelerated improvements in output per man/hour, but also that these improvements are reflected in an increase per man/year. After stating the basic needs, namely, adequate supplies of raw material, coal, power, equipment, especially machine tools and their proper use of these and of manpower, and giving the welcome news that the situation regarding the production of machine tools had improved, the report discusses the importance of quality, re-deployment of labour and machines and the need for examining productive and distributive processes by industrial consultants and other means. It must, however, be stressed so far as scientific research work in general is concerned, states the report; that an immediate increase in productivity depends more on understanding the implication of scientific research and on the application of existing knowledge than on results of new research.

Of great importance is the need for the development of control mechanisms, which are being studied at the National Physical Laboratory; and for facilities for development, by which is meant the stage between scientific discovery in the laboratory and production in the factory. Furthermore, there is the importance of continued and increased standardization and the subject of measurement of productivity itself—a matter of exceptional difficulty but essential if we wish to know where we are going. The problem is being examined by the Board of Trade.

A valuable section is that on Technical and Operational Research. The latter is defined as the use of the scientific method to provide executives with an analytical and objective basis for decisions. It has the advantage that it can produce results in a shorter time and with less expenditure than fundamental technical research.

The importance of human factors is stressed, and managerial practice (e.g., training of foremen and joint consultation) and "Human Engineering" researches are being examined.

Four Freedoms for Industry

BEFORE an audience of some 300 members and guests of the British Plastics Federation at the annual luncheon at the Savoy Hotel on April 27, the Chairman, Mr. C. F. Merriam, delivered a spirited talk on the past and future of the plastics industry.

We had learnt more about our products, he said, and we were establishing better standards and performances for our raw and finished materials.

Of the future, he said, so long as we are left to our own devices and had freedom from crippling purchase taxes, freedom to trade anywhere, freedom to buy machinery, and freedom to put our factories where we liked, we should surprise ourselves at the progress we should make.

Among the many guests there were Swedish, Norwegian, Danish and French visitors, and in welcoming them, the Chairman was especially glad to see Mr. Harry Nyström, President of the Swedish Plastics Federation, who had shown such great hospitality last year to British visitors.

Mr. Nyström's talk on "Plastics in Sweden" is reported on page 233.

Leslie McArd.

On going to press we are shocked to hear of the death of Leslie McArd, of Robert McArd and Co., Ltd., of Denton, Manchester. This great worker for the industry will be missed not only in this country, but by his many friends abroad.

MOULDING POWDER AND SHOT

P.V.C. Publicity

The P.V.C. Section of the British Plastics Federation will soon, we believe, publish a special pamphlet to send to retail organizations and large retail stores, telling them more about p.v.c. sheet and similar goods. It will give them, their salesmen and saleswomen, and thus the public, the real facts on this material, which received such a setback because of public reaction a few years ago. It will tell them what to do with it and what not to do. This, we are sure, is one of the best methods of tackling the job. Incidentally, we must congratulate some of the manufacturers on the great improvement in quality that is now being put on the market. Better raw material, better plasticizers, better printing, thicknesses up to 20 thou., and collaboration have done the trick.

* * *

Vinyl Plastisols

Mr. George B. Koch, of B. F. Goodrich Chemical Co., in his address before the sixth annual conference of the Society of the Plastics Industry at Santa Barbara, California, gave figures of American production of coated fabric with vinyl plastisols and organosols (anglicè, polyvinyl pastes). In 1939, 55 million yards of coated fabric were made, mostly of nitrocellulose. In 1947 this figure had jumped to 130 million yards, of which 50 million was vinyl-coated fabric and 20 million of unsupported polyvinyl plastic. Estimates for 1948 were 50 million yards of nitrocellulose, 60 million of vinyl-coated fabric and 25 million unsupported. These predictions were found to be accurate. He also repeated Mr. Scott Moulton's generous pat on the back for this country: "Although the restricted economy in England has forced many hardships upon industry, it has led to many technical advances. For in most cases fabricators are unable to purchase elaborate machinery and as a substitute have shown great ingenuity in designing less-expensive equipment which will do their job as well."

* * *

"Best Boss"

It is not often we give publicity to local doings, but this one deserves special mention. Mr. C. A. Cornish, head of the Ebonite Department of the United Ebonite and Lorival factory at Little Lever, near Bolton, has received a gift from 64 of his girls in the finishing shop. It was a completely spontaneous gesture in recognition of his help to them in their work. They declared he was the best boss in Lancashire. No doubt there are other "best bosses" in Lancashire and elsewhere, but it is a pleasure to hear of one from the lips of the workers themselves. This type of boss-worker relationship *has* been known to grow without the aid of Government ægis.

* * *

Table d'Hôte

While in Paris last January for the big "do" at La Maison de la Chimie, by a strange coincidence we happened to be present at a crowded cocktail party on the opening of a new restaurant, at 124, Rue La Boëtie, by a friend of mine, Jean Pagès, who used to run La Coquille and La Cigale in London during the war (Gordon Kline, of the U. S. Bureau of Standards, and N.J.L. Megson, of our Ministry of Supply, will both remember him). Jean presented me to Mlle. Mistinguett, whose legs are still worth a million and who showed considerable intelligence by asking: "Ah, Monsieur Doguesboddee, when are you great scientists (sic!) going to produce the plastic plate unbreakable, the plate that one can heat, the plate that one can wash with of the water boiling?" I looked into her lovely eyes and said—well, fellows, what could I say?

DOGSBODDY.

Plastics in Sweden

By Harry Nyström*

President of the Swedish Plastics Federation

THE plastics industry in Sweden was born in 1917-18, when two companies began to manufacture moulding powders of the phenolic type, and also to make mouldings. In the period between the two world wars the industry developed slowly, but 30 to 40 companies were producing plastics in 1939.

When the war ended and Sweden could again buy machinery and raw materials from Great Britain, the U.S.A. and other countries, the number of firms engaged in the plastics industry increased rapidly. Between 250 and 300 concerns are to-day producing plastic materials and semi-finished and finished products. There are also many firms acting as agents for foreign manufacturers.

The Swedish Plastics Federation has to-day a membership of 155 firms. All the important compression and injection moulders, extruders, and film and leather-cloth manufacturers are members of the Federation; as to the moulders, we know that their capacity represents about 75 per cent. of the total Swedish capacity.

You get some idea of moulding capacity in Sweden, when it is mentioned that we have about 900 presses (total tonnage 80,000 tons) and between 150 and 175 injection moulding machines (total shot capacity about 30 lb.).

Four machines are engaged in the extrusion of thermoplastic materials, in part specializing in the extrusion of p.v.c., which is also used by the cable works; p.v.c. sheet is manufactured by six or seven firms, and p.v.c. leathercloth by four firms.

The making of articles in acrylic plastics by machining, blowing and other methods is fairly new in Sweden, mostly because of difficulties in getting materials; eight to 10 firms now specialize in this kind of work.

Phenolic resins are manufactured by nine concerns, including those making resins for the paint and varnish industry; the makers of phenolic moulding powders are four; those of laminates are three. There is one maker of melamine resins, adhesives and moulding powders, this production being wholly based upon Swedish raw materials. We also have two manufacturers of urea moulding powders, and four or five companies manufacturing urea adhesives.

Polyvinyl chloride and some of its copolymers are also manufactured in Sweden; the production to-day covers consumption, with the exception of some types needed for the cable industry. Polyvinyl acetate and polyvinyl formal are produced, but no cellulose plastics are yet manufactured in Sweden, although two companies are compounding cellulose acetate and other moulding powders from imported flakes and plasticizers.

We have in Sweden a large production of regenerated cellulose film and a smaller one of cellulose-acetate film. At least two firms, in the very near future, are ready to start the commercial production of acrylic resins in the form of sheets, and also as moulding powders.

From the data given in this short survey, it will be understood that we in Sweden are still depending on imports of various materials. Before and during the war most plastic materials and productions came from Germany, and only to a small extent from Britain and the U.S.A. To-day, most materials are imported from Britain. Even if the picture is again changed, due to currency restrictions, etc., I believe that Britain will still remain the main supplier of materials for the Swedish plastics industry.

*From a speech at the 14th Annual Luncheon of the British Plastics Federation in London, April 27.

A Reference Cabinet for Samples of Glass

THIS is the story of a sequence of designs for a box intended to hold and display, with easy access, a representative selection of a certain manufacturer's samples of glass. These boxes, issued for the convenience of architects and others, have been in use by Pilkington Brothers, Ltd., of St. Helens, Lancs, who eventually turned to plastics as a medium of construction.

The first box, introduced in 1920, was of wood, that being more or less the conventional material of which to make a box; the latest (January, 1949) was moulded by Ashdowns, Ltd., of St. Helens. The first box (Fig. 1) was of the simplest design, suitable for holding a number of glass samples, each measuring 4 ins. by 3 ins., on edge in mass. Such a box, extended in length and subdivided to accommodate a larger number of samples, was in use until the outbreak of the Second World War in 1939.

In 1945, when the re-issue of basic samples became imperative, there was a shortage of material and also of samples. The most compact solution appeared to be that of a box made on straightforward lines (Fig. 2). This box was something of a stop gap while Pilkington's Design Committee got down to the task of evolving a prototype for an entirely new sample box which was better suited to post-war years.

With the object of meeting their needs, Pilkingtons set forth the following requirements for the new box:—

(a) Each sample must be accommodated separately.

(b) The samples must be grouped.

(c) They must be so fitted that it would be easy to remove and replace them individually.

(d) It was necessary to be able to locate any particular sample at a glance.

(e) Samples when replaced should not foul the lid of the box, thus preventing it from closing easily.

(f) There should be provision for a contents slip.

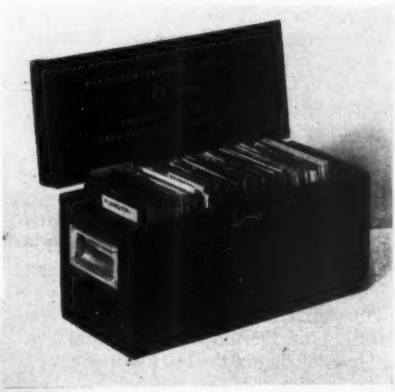


Fig. 2 (above).—First post-war sample box, also of wood (1945).

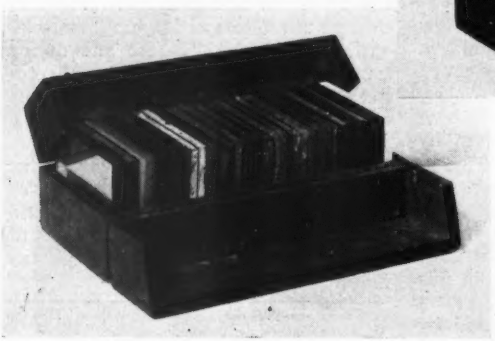


Fig. 1 (left).—Wood box containing samples on edge in mass, introduced 1920.

Fig. 3 (right).—The first prototype for a wood box by the Pilkington Design Committee (1945).

Fig. 4 (left).—An improvement on Fig. 3, also in wood, accommodating the same number of samples but with more space to facilitate handling (March, 1945).

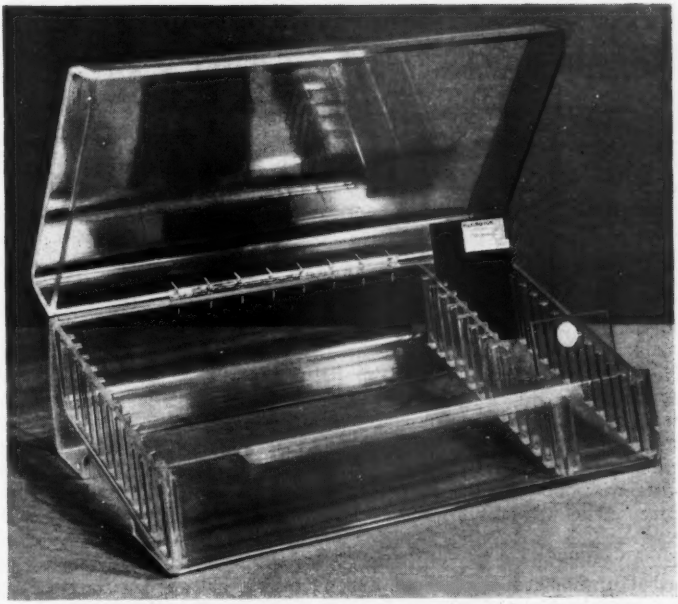


Fig. 5.—Prototype for sample box made in "Perspex," produced after consultation between Ashdowns, Ltd., and the Pilkington Design Committee (October, 1946).

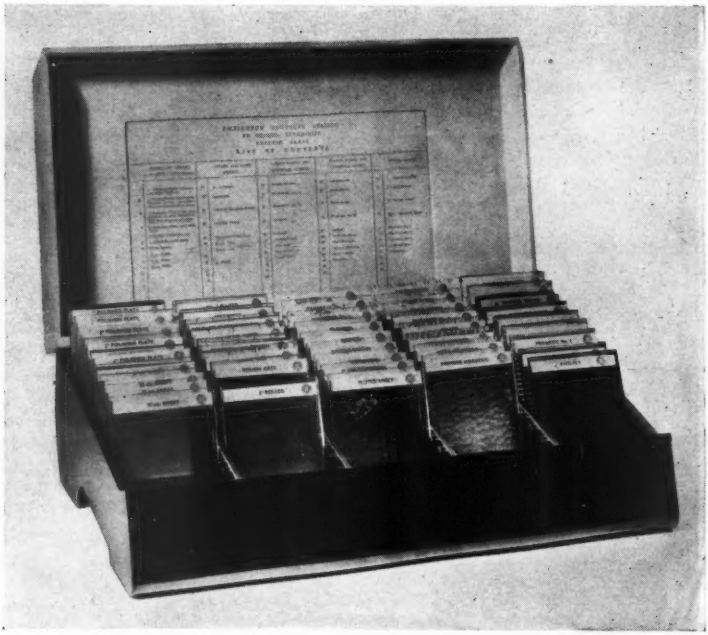


Fig. 6.—The final result by Ashdowns Ltd.—a moulded box with the lid in urea-formaldehyde and the base in phenol-formaldehyde. (January, 1949.)

(g) Provision for new samples was also desirable.

The first prototype of the Design Committee (Fig. 3) was produced (1945) by Pilkington's own technicians.

In March, 1945, another design was produced by the Design Committee (Fig. 4). This box accommodated the same number of samples as the prototype (Fig. 3), but provided more space to facilitate handling.

Meanwhile, the Design Committee was considering the use of plastics for making the box. In October, 1945, after discussions with the Pilkington Design Committee, Ashdowns, Ltd., produced a prototype in "Perspex" (Fig. 5). This showed the possibilities, although it was agreed that a moulded box would be more economical and satisfactory than a fabricated box, particularly as the boxes had to be produced in quantity.

For the final result in design (Figs. 6 and 7) phenol-formaldehyde was employed for moulding the base of the box, and urea-formaldehyde for the lid. It was considered that the use of plastics would offer a more attractive article than one which had previously been made of wood.

In evolving the final design, Ashdowns had the advantage of seeing all the previous attempts which had been made to arrive at the ideal form of box to house and display a complete range of Pilkington glass samples, and they duly took note of all the details of requirements. They appreciated immediately the difficulties which were being experienced in reaching their objective, and also the fact that a wooden box or cabinet lacked refined artistic shape, the design, and the finish which were so necessary for the article in question.

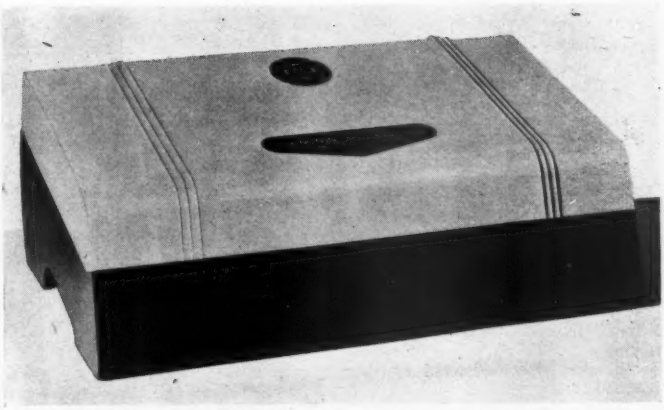


Fig. 7.—Exterior of moulded box, seen also in Fig. 6. (January, 1949.)

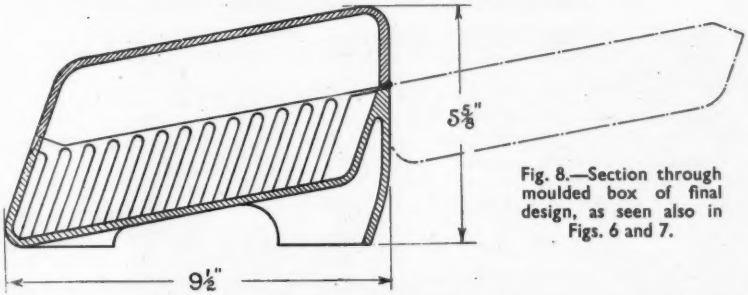


Fig. 8.—Section through moulded box of final design, as seen also in Figs. 6 and 7.

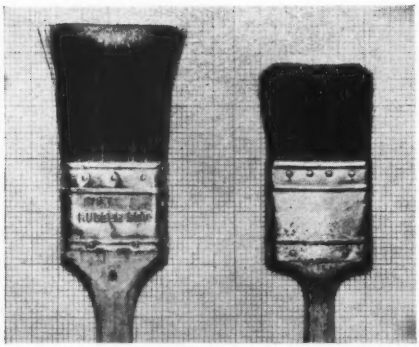
As a mere container, the cabinet was required to accommodate accurately and individually 60 glass samples, each measuring 3 ins. wide by 4 ins. high, and of varying thicknesses, each sample bearing a descriptive label. It was therefore necessary to tilt the samples at an angle which enabled each label to be clearly visible above the sample immediately in front of it. This requirement presented certain difficulties owing to the necessity of having a straight draw in the moulding tool, but the difficulties were overcome by adopting the design shown in section in one of our illustrations (Fig. 8), by which the base became a practical moulding proposition.

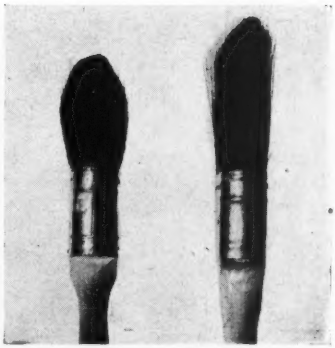
As it was necessary also to provide for an index of the samples for quick reference, a suitable recess was incorporated on the underside of the lid to locate this feature.

Another problem concerned the hinges. By using a hinge of the piano-type, the lid, when fully open, sits flush against the base. This arrangement was carefully planned in order to reduce the stresses; the slots at the base of the cabinet were provided for ease of lifting (weight being appreciable when the box is filled with samples); and a slight chamfer was incorporated at the front of the base to provide a finger grip.

Herein lay the chief difference between the artistic type of designer and the result achieved by the technical designer in plastics. The box in its final shape retains artistic appeal, but at the same time it adequately fulfils its intended function.

L





These brushes were subjected to tests on general ship work, i.e., steel, wood, canvas and cork cemented surfaces, at an Admiralty dockyard. The photographs were taken after 175 working hours. Left to right: Nylon, original length of filaments 2½ ins.; bristle (mixture); bristle (mixture); nylon.

Nylon Paint Brushes Have 4 × Life

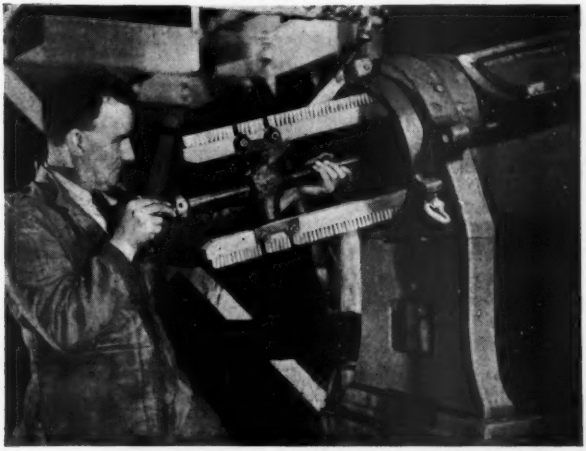
DURING a recent visit by the Press to I.C.I. (Plastics Division) at Welwyn Garden City, we had the pleasure of seeing what may be called the next stage in the progress of nylon, or rather the nylons—since, chemically speaking, there are many.

The progress is clearly three or more fold. We saw not only several important new applications of the filament form of nylon, which the world generally recognizes as stockings and tooth- and hair-brushes, but also the advent of new nylons, in granule form, for injection moulding and extrusion, and in another form, as film. The latter, that is, the moulding and film types, we shall describe at some length in our next issue. In what follows we shall confine ourselves to a new lesser-known industrial use of the monofilament.

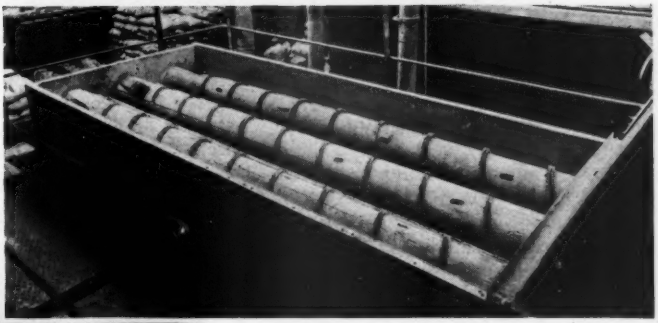
Of very special interest is the paint brush, in which the conventional animal bristle has so long held sway. In the normal toothbrush or hairbrush the filament is cut more or less "square," that is, vertical to the main axis of the filament. Obviously, too, this is necessary in many industrial brushes such as are seen in the photographs on the opposite page. In the paint brush, however, at least in the best qualities, the whole of the bristle is used, that is, bristle complete with tapered end.

After a long period of research and development work, a method of tapering nylon has been evolved by grinding, the capillary action of the nylon being improved in consequence, so that paint is applied perfectly uniformly. Thus, in all ways, from the practical point of application of paint, which we observed under actual comparative tests at Welwyn, the new nylon brushes are as efficient as conventional type brushes made from the finest bristle.

What is perhaps of still greater interest and value is the life of these brushes. Nylon filament, as is well known, has a tensile strength of about 50,000 lb. per sq. in., that is, only slightly less than that of steel. Furthermore, it is exceptionally tough, abrasion resistant and resilient and is unaffected when exposed to water, solvents and most chemicals, with the result that the new brushes, for paint or distemper, have a life four to five times that of animal bristles. The photographs at the head of this page speak eloquently of the economic value of this fact.

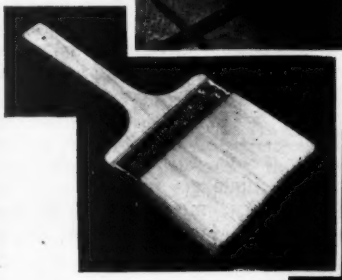


(Left) Nylon fruit-pulping brushes in use at the Silvertown works of James Keiller Ltd. Brushes made by Webb (Jarratt and Co.) Ltd., London.



(Below) 6-in. distemper brush made from I.C.I. tapered nylon monofil.

(Above) Nylon brushes for sieving dry powder at works of Plant Protection Ltd. Brushes made by Wm. Haywood (Maidstone) Ltd.



(Right) Nylon floor-scrubbing, floor-polishing and carpet-shampooing brushes as used in Dixon machines. (Nash's Brushes Ltd., Watford.)

World's Industry Employs Plastics

GENERAL ENGINEERING

Jaws for Chucks.—Moulded phenolic plastics are used in a common lathe chuck (Gisholt Machine Co., Madison 10, Wisc., U.S.A.) in order not to damage work, in particularly thin-walled parts. (" Machine and Tool Blue Book," 1949/Mar.256.)

New materials with new applications include a short-cure thermosetting alkyd moulding compound and an urea-formaldehyde compound with shortened moulding cycle, melamine formaldehyde thermosetting resin of high translucency, heat-resistant polystyrene, stable high-temperature thermoplastic and abrasion-resistant vinyl. (" Materials and Methods," 1948/Nov./76.)

Nylon bearing material was described by R. B. Akin in a paper read before A.S.M.E. Of the large number of nylon types now available, FM. 10001 is the most rigid, has the highest softening temperature, and is the least expensive. It is handled by injection moulding. When used as bearings, a lubricant is required for light loads at high speeds and for moderate loads at low speed. (" Materials and Methods," 1949/Feb./95.)

Compressed wood fibre. — Manufactured sheets of wood fibre (" Masonite ") are suitable for both mass- and small-quantity production of a variety of products. Applications and data on average properties are given in "Materials and Methods," 1949/Feb./54.

Thermosetting laminates.—This second instalment deals with the application of these materials, based on their physical, chemical and electrical properties. Advantages and limitations enable a working comparison of the laminate grade with each other and with other materials. (" Product Engineering," 1949/Feb./138.)

Prevention of warping.—In order to prevent warping of compression-moulded components, special fixtures have been designed by General Electric Co. to keep parts in shape. Four illustrations are given for small radio cabinets, handles for soldering irons, desk-top book racks, etc. (" Machinist," 1949/Jan. 29/1293.)

Silicone sponge is suitable for use as gaskets and as vibration mounts; it retains its properties through a temperature range of − 70 F. to + 500 degrees F. The material is available in extruded or moulded shapes, as well as sheets. (" Machine Design," 1949/Feb./152.)

MISCELLANEOUS

Mould Design.—Recommendations for designing plastic moulds, and for the design of plastic components with inserts, are given by W. Nichols. The article is well illustrated, and hints are included on the design of ribs, metal inserts, hinges, bosses, etc. (" Machinery Lloyd," Cont. Edition, 1949/Mar. 19/52.)

Melamine mouldings.—A flowsheet on the production sequence of the thermo-hardening melamine compounds, which strongly resemble urea resins has been published as " Mechanical World " Flowsheet 183. (" Mechanical World," 1949/March 25/325.)

Silicones.—An authoritative survey of the sources and characteristics of silicones

has been given by Dr. D. V. N. Hardy in a paper before the Oil and Colour Chemists' Association. From the discussions it appears that some of the expectations advanced two to three years ago have not yet been fulfilled. ("Chemical Age," 1949/Feb. 26/322.)

Glues and plywood.—Investigations with glues, such as casein, prolamin-formaldehydes, phenol-formaldehyde, and Tegofilms, and paints such as Bitumax, cashew-nut shell oil and phenol-formaldehyde varnish, have been published by the Forest Research Institute, Dehra Dun, U.P., India.

Mechanical joint. — A simplified mechanical joint for furniture (Camlock Division, Western Automatic Machine Screw Co., Elyria, Ohio, U.S.A.) is stated to replace woodscrews and glue in furniture assembly. ("Business Week," 1949/Feb. 5/44.)

Nylon-pile carpets for aircraft use have been developed with a weight of only 2.4 lb./sq. ft. The Producers are Alexander Smith and Sons Carpet Co., U.S.A. ("Business Week," 1949/Feb. 5/50.)

Television masks for framing the front end of the cathode-ray tube are injection moulded in ethyl cellulose in a dull finish to improve visibility of screen. Masks for receivers of 52 sq. ins. are made in this way. ("Materials and Methods," 1949/Feb./71.)

Plastic coatings.—Two fields of study have recently appeared as the result of a questionnaire on the measurement of coating hardness: Elastic deformation and plastic deformation of the coating films. Plastic deformation will have to be further subdivided according to whether it is with or without rupture of the coating film. (A.S.T.M. Bulletin, 1949/Jan./67.)

Transparent spray. — Produced by Foster and Kester Co. Inc., Philadelphia, dries in less than one minute, leaving a clear satin finish retaining flexibility of material to which it is applied. "Machinery" (N.Y.), 1949/Jan./188.)

Synthetic rubber.—G. Fromandi and H. Roelig have investigated the influence of various filters on the elastic behaviour of Buna S rubbers, considering at the same time the resistance against deformation and general mechanical properties. It is distinguished between materials stressed dynamically or statically. ("Kunststoffe," 1949/Dec./245.)

Infra-red prism spectrometry on plastics.—E. V. Plyler used a prism of KRS-5 (thallium-bromide-iodide) on a Parkin-Elmer spectrometer to measure the transmissions of various substances, among them polystyrene and polyethylene in the infra-red region from 24 to 40 microns. (Journ. Res. Nat. Bur. Standards, 1948/Aug./125.)

Stretch tester of new design for plastics uses an electric weighing system, based on the strain gauge systems. Loads from 2 gm. to 5,000 lb. can be applied, stretch action is controlled by a pulling jaw with speeds from 0.02 to 20 in./min. A high-speed recorder gives load-elongation curves. The makers are Instron Engineering Co., 2 Hancock Street, Quinery, Mass., U.S.A. ("Business Week," 1949/Feb. 26/62.)

Laminated timber frames have been used in Sweden for aircraft hangars and chemical works buildings, with spans up to 216 ft. ("Wood," 1946/**13**/306.)

Synthetic fibre.—Resembling wool has been produced by Kurashi Rayon Co. (Japan), on a polyvinyl basis. Polyvinyl acetate and alchoholic caustic soda are employed and the solution is treated in a bath of zinc and sodium sulphate. ("Chemical Age," 1949/Feb. 5/241.)

Protective film.—Sheet metal is protected by a vinylite resin solution during drawing and pressing, thus avoiding scratching and abrading of sensitive metal surfaces. The same solution can serve as packaging materials. ("Machinist," 1949/Feb. 19/1404.)

Adhesives. — Indian investigations showed that storing of Acro-grade Tegofilm in ordinary packing loses power of adhesion in about three months' time; when sealed in a parcel it is usable up to one year. (Forest Research Inst., Dehra Dun., U.P.)

International Plastics

Continuing from our April issue, we give abstracts of two more papers which were read at the meeting of the Journees Internationale des Plastiques held in Paris, in January last.

British Specifications for Plastics

By G. DRING, M.A., F.R.I.C.
(Research and Development Director, Bakelite, Ltd.)

ALTHOUGH the speaker's talk referred more specifically to the revised B.S.771 (Phenolic Moulding Materials) with reference to the use of statistical principles in assessing tests, the author began with a review of other existing ones, including: Amino Plastic Moulding Materials B.S.1322; Polystyrene Moulding Materials B.S.1493; Cellulose Acetate Moulding Materials B.S.1524; and Synthetic Resin-bonded Paper Sheet for the building industry B.S.1323. This series will shortly be augmented by a standard for laminated sheet. In addition, the Electrical Industry Committees of the British Standards Institution have issued B.S.1137, 972 and 1314, which lay down the minimum requirements for resin-bonded paper sheet, resin-bonded fabric sheet and resin-bonded paper tubes respectively.

Mr. Dring dealt with the Certification Scheme which was introduced in 1944 and with the revised B.S.771, the two being purposefully complementary. The most important revision in the British Standard is the introduction of the use of statistical methods, that is, quality control charts.

Following the permission to use the licensed Certification Mark, the manufacturer is obliged to apply the full B.S.771 tests at intervals of not more than 14 days, to apply a certain limited number of tests to every batch of material, and to test all batches of raw materials used in the manufacture of moulding materials. A proper record of the tests is to be kept, the British Standards Institute having the right to enter the testing laboratory of the licensee at any time to verify that satisfactory quality is being maintained. Quality control charts are the most convenient means of providing this evidence. The certification of mouldings as distinct from moulding materials is more difficult, owing to the small number of specifications for finished mouldings, of which amino plastic picnic ware and toilet seats are two examples. In the first case, in addition to requirements to withstand boiling water and be free from poisonous substances, a minimum wall-thickness is stipulated and tests for shock resistance are included.

By far the larger proportion of mouldings are not covered individually by any British Standard. However, the technical importance of many "assembly" mouldings (technical mouldings) which are often components of other structures is such that certification is desirable and a new specification B.S. 1253/1949, Technical Mouldings (Plastics), is being drawn up. It is especially interesting in that Mr. Dring suggests that, in addition to obvious requirements, there is likely to be an additional request for the moulding to be submitted to the Mark Committee who must be satisfied that it is suitable for the purpose for which it is to be used.

The speaker then spoke of the special advantages of the use of quality control charts for the revised B.S.771, which clarifies a situation in which while the quality of moulding powder is known to be uniform, yet variability inherent in the method of testing gives results that are scattered about a mean with a coefficient of variation of the order of 10-15 per cent. of the mean.

In B.S.771 are tabulated basic values for different properties which are to be tested and they are the values which would be obtained if a large number of tests were carried out on a batch of material which just passes the requirements of the Standard.

To conform with B.S.771 the results on any given sample must be in statistical conformity (at the 0.01 probability level)

with the basic values given in the tables. In the tables are given the basic values of mean and basic values of standard deviation. The material is deemed to comply with the Standard if the mean and standard deviation are not worse than the relevant qualifying limits in the tables.

There is no need whatever to make a large number of tests. Any convenient number of test specimens can be tested, but appropriate qualifying limits at the 0.01 probability level will vary according to the number of test results. The method of calculating the qualifying limits for a given number of test specimens is described in an appendix.

These qualifying limits for a small number of tests do not represent the level of quality demanded by the Standard. The quality required is that given by the basic values and material of a quality lower than these basic values is not acceptable. Because of the operation of chance arising from the variability of test methods, and only because of this, the Standard permits the results of a relatively small number of tests to be below the basic values by an amount consistent with statistical theory.

Past, Present and Future of Plastics

By J. DUCLAUX, Professeur au College de France, Membre de l'Institut

OF all the papers presented, that by Professor Duclaux was quite unique in its profound knowledge of the history of his subject, in his philosophical, and sometimes humorous, treatment of the whole subject, and in his breadth of views concerning the possible trend of developments. It was an enthusiastic appraisal of the great future of plastics and yet contained warnings for those who wished to travel too fast on purely mathematical theories regarding their properties and methods of formation. Owing to space and other limitations, we are not able to publish his whole paper, which is some 10,000 words long, but readers should try to read it when it is finally published. What follows is an abstract of his final theme—what synthetic chemistry may one day achieve.

More than any other science, chemistry is remaking the world, attempting, and very often succeeding, in reproducing natural products in the laboratory, and synthesizing them on a large scale in the works. Sometimes, as in the case of sugar, it has failed; on the other hand, the chemist often improves on Nature, for he has replaced natural indigo with the purer synthetic material and madder by alizarine from coal tar, vitamins by synthesis, and acetic acid and aldehyde from acetylene, to mention but a few. It can be said that, were it not a question of price, chemistry could replace Nature in almost all its products—with the exception of one, the large molecule!—the macromolecule. Of the three great classes of natural macromolecules, the polysaccharides (that is cellulose, starches, etc.), proteins and the natural rubbers, we have only succeeded in synthesizing the last-named—in this latter case we have even improved on the natural type.

Never, in any reaction, has a chemist been able to report the formation of cellulose. We know it is built up of simple sugars by condensation—it breaks down to them on distillation. The situation is the same as faced the rubber problem. Rubber was found to be made up of a large number of "isoprene" molecules which it gave on distillation of rubber, and "isoprene" was "recondensed" (polymerized, in this case) back to rubber by Bouchardat. But in the case of cellulose, it is quite easy to "condense" sugars simply by heating; yet instead of getting cellulose or starch or glycogen (as formed in the liver from sugars), we only succeed in getting caramels.

The whole difference between our methods and those of Nature in this and many other natural syntheses is that natural syntheses are directed; our own methods are haphazard. Nature takes a molecule of glucose—a simple sugar—by the hand, and leads it to the desired point and welds it to the next molecule of glucose. Our methods sometimes appear to be quite fortuitous—as if we took our

molecules and shook them up in a bag and hoped for the best—just as if we were to take some moulding powder and an extrusion machine, shook them in an enormous bag and expected to get moulded objects from them.

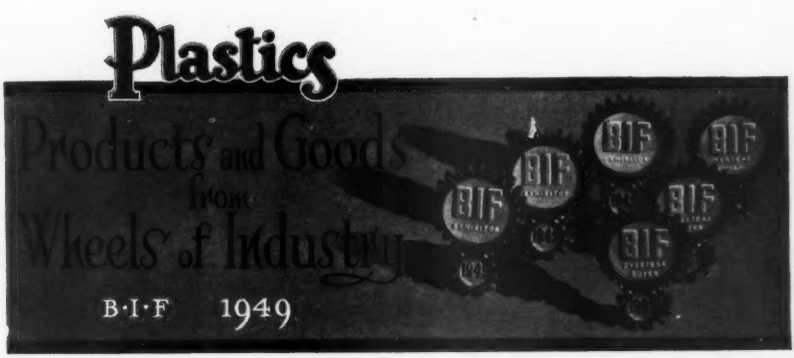
It is clear that we, too, must direct the reaction; and here theory may help us. In every system under chemical change all possible reactions are produced simultaneously, but with very different velocities. All come to states of equilibrium, which is never complete, and these states vary in proportion from zero to infinity. To direct the reaction, that is, to find out our most favourable one, is the rôle of "kinetic chemistry." Such work, with the help of wave mechanics and electronic chemistry, may yet help us in our search of directed syntheses. We do not know if it will ever help in producing cellulose, but what an effect it would have on our lives!

Certain forms of cellulose are, one might say, luxuries. Cotton, for example, is fantastically more costly than wood, although they are two varieties of the same substance. It is not too absurd to suppose that one day we may replace cotton itself by a synthetic compound, just as silk itself has been replaced. Cotton is so slowly produced in Nature, subject to the rhythm of the seasons, irregular as to the harvest, confined to definite regions, and needs a specialized labour employable only for a short period of the year. Compare this with the ordered production of rayon in a factory which produces filament day after day, month after month, without stopping. Before this ordered haste, we may ask whether synthetic cotton is not inevitable. After all, there is only carbon dioxide, water and energy in it, and we have plenty of them.

But man is not only an imitator; he is, above all, a creator. The production of a natural material is for him only a milestone at which he does not stop for long. Thus, synthetic indigo was soon left behind and the dyestuffs indanthrenes and phthalocyanines were made. Cocaine has given way to novocaine, and new and more favourable synthetic fuels replace the old type. Similarly, with natural rubber, Bourchardat produced the first synthetic rubber from isoprene, which is the unit constituent of natural rubber, but isoprene is now never conceived as a suitable raw material. It was just an original model, for to-day synthetic rubbers surpass natural rubber in many of its properties. In the story of plastics, everything is invention and those working to make it are charged with remaking the world.

BAKELITE, LTD., have sent us a copy of their new technical data upon the machining of Bakelite laminated. This book, of 62 pages, deals very thoroughly with its subject matter, and the various machining operations are arranged alphabetically for easier reference. The task of machining Bakelite laminated is not a difficult one; it can be undertaken with normal metal and woodworking tools, but some methods of machining have been shown by experience to be more effective than others. It is these practical hints on tools and methods, gathered over the very long time that the material has been in production, which makes the present publication especially useful. For example, it is pointed out that great improvements can sometimes be made by reversing the usual order of tool and work. Higher rates of production can often be obtained by mounting the tools—particularly shaped tools—in the chuck and holding the work in suitable jigs on a turret. In this way a machined piece can be removed from the rear of the turret and a new work piece inserted with maximum convenience and without stopping the machine. Bakelite laminated does not impose any real restriction on machining methods; its laminated origin, however, should be borne in mind, even though the material is effectively homogeneous, and precautions in certain operations are therefore necessary.

The left-hand pages throughout the book are taken up by an excellent series of close-up illustrations and diagrams to augment the text. Copies are obtainable from Bakelite, Ltd., 18, Grosvenor Gardens, London, S.W.1.



HALF-WAY through the Fair the B.B.C. announced that 11,000 buyers from overseas had attended. We do not know if this is a record, but it is a very good number. Among them, Danes, Norwegians and Swedes were probably to the fore; there was also a large number of Dutch, Belgians, French and Portuguese. A few Australians and Americans were advance guards for the second week, so it was promised. All were loud in their praises of the stands in the Plastics Section.

We welcome the coming of some new concerns at Earls Court: Moulded Components (Jablo), Ltd., who are far from new to the industry, have very successfully entered the textile industry (one of the most promising for resin-bonded laminate), in addition to heavy engineering. Commercial Plastics, Ltd., C. and C. Marshall, Ltd., Duraplex (Plastics), Ltd., and Bernard Wardle and Co., Ltd., all produce excellent p.v.c. in imitation of leather, etc. (Bernard Wardle showing the loveliest "tapestry" chair or settee covering we have yet seen). Cascelloid, Ltd., new to the Plastics Section, is one of the oldest of toymakers and also showed many interesting novelties, such as transparent balls containing ducks on water, polythene beakers and "squeezable" polythene bottles. Henri Selmer and Co. Ltd., a new concern to our industry, showed novel toys. The Triplex Safety Glass Co., Ltd., new to this section, showed remarkable fabrications from transparent sheet, including a more or less complete kitchen—sink, draining boards, cupboards, etc.

The pressing of "Perspex" in a Turner press is demonstrated by I.C.I. (Plastics Division).

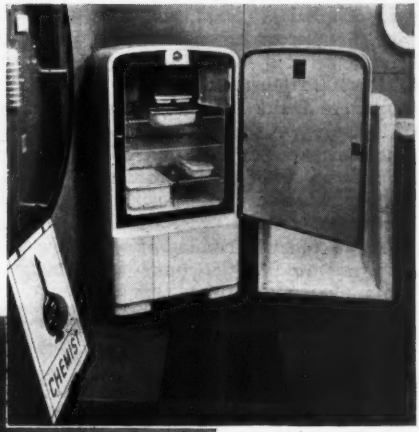
The photographs that follow give a preliminary view of individual exhibits, which we shall detail at greater length in the June issue. Further photographs are also to be published of some exhibits at Olympia, and those of plastics machinery and materials in the Engineering and Hardware Section of the Fair at Castle Bromwich.

M

Moulded Components (Jablo) Ltd. Laminated material for textile picking sticks and bobbins; also for press tools, golf-club heads, etc.

MICA PRODUCTS LTD.
1, Downs Park Road, DALSTON, LONDON, E.8.
Moulders & Fabricators in Plastics
Mould & Jig Makers
INJECTION MOULDINGS

Mica Products Ltd. show machined mica for electrical components and also injection moulded units.



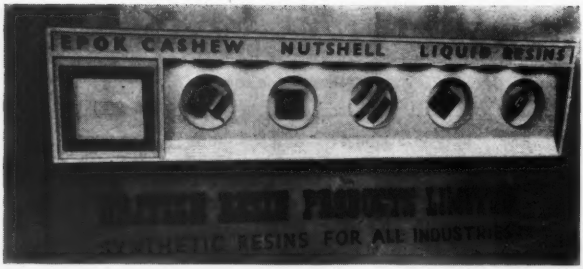
Thermo-Plastics Ltd. (above and left). Polythene and "Perspex" fabrications for refrigerators, shop signs, aircraft and display units, e.g., blanket holders. Specialities in kitchen units were also shown.

(Left) P. B. Cow and Co., Ltd. The moulding section of this concern exhibited a fine range of picnic ware, hollow-ware and toys.

(Above) British Artid Plastics Ltd. This electrical food-mixer contained several mouldings by this concern, including the indicator switch for changing types of mixing requirements.

(Above) Stanley Smith and Co. Two beautifully designed and executed bags of embossed p.v.c. sheet supplied by this company.

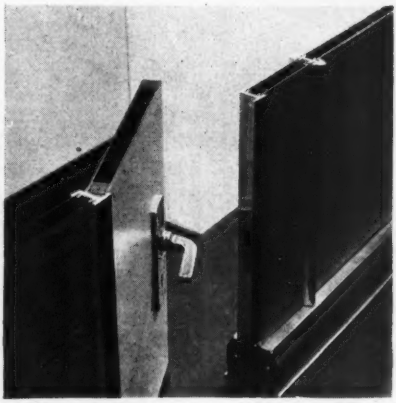
(Right) Mentmore Manufacturing Co., Ltd. This well-known pen manufacturing concern showed some excellent examples of toy furniture.



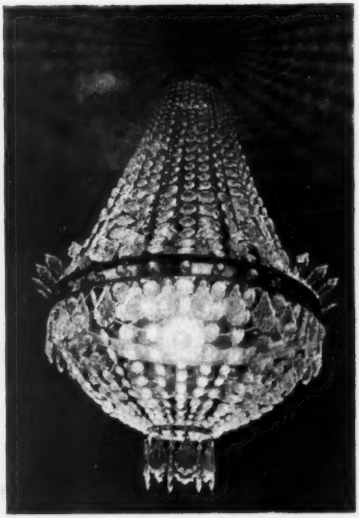
(Left) Epok Cashew resin (British Resin Products Ltd.) and its special uses as bonding medium.

(Below) Geon, by British Geon Ltd. expands its uses, as sheet, extrusions and paste or solution.

(Left and below) Holoplast Ltd. shows its medals in cubicle construction.



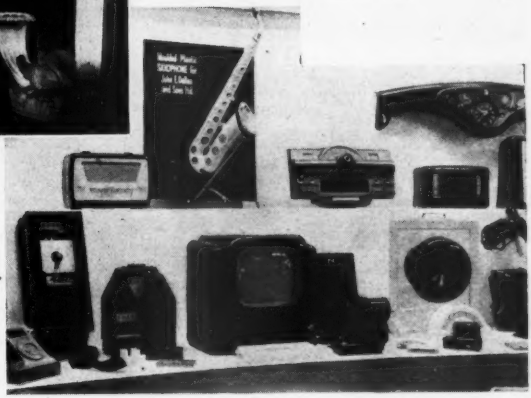
(Left) I.C.I. (Plastics Division) shows polythene in moulded and welded forms.



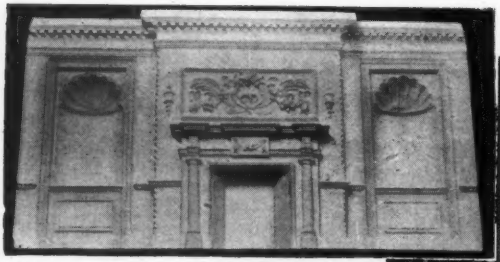
Stone and Simmons. A magnificent electrolier of moulded transparent plastic. This firm also displayed plastic tiles.

G. Read and Co. (Hackney) Ltd. Table ware, safety razors and flower-holders.

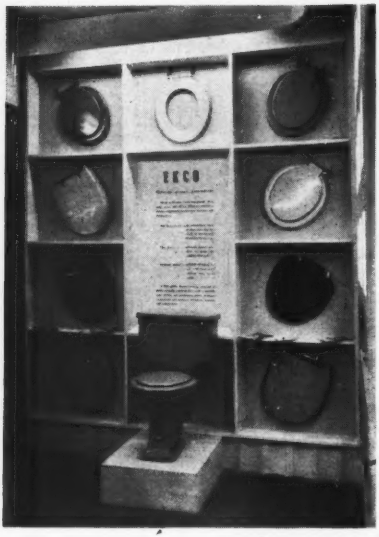
(Above) Commercial Plastics Ltd. The excellence of p.v.c. sheet was noted in the 1949 Fair. This stand displayed "crocodile," "lizard" and other embossings.



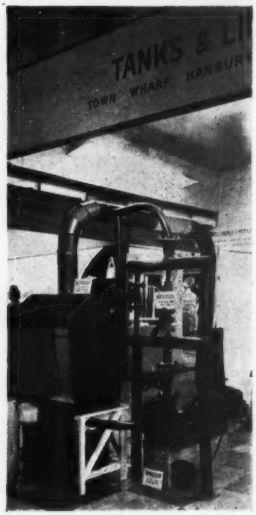
(Above and right) National Plastics Ltd. A new development is Cristaplex—a cellulose acetate for casting purposes. As for mouldings, the injection-moulded saxophone was a new beauty.



(Above and right) "Vinamold," by Vinyl Products Ltd., advances into the world of cinema for "architectural" reproductions.

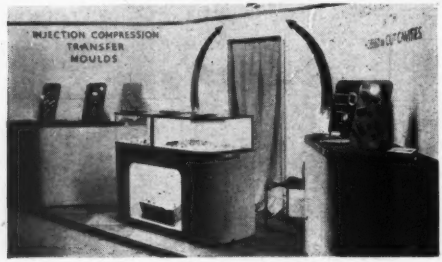


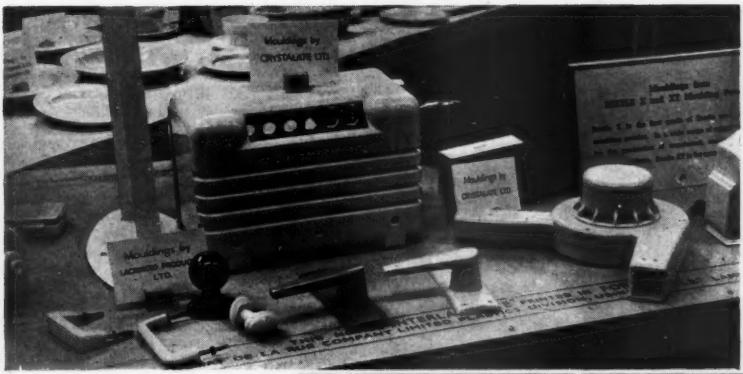
(Left) E. K. Cole Ltd., specializing in large mouldings, displays a new range of lavatory seats in colours.



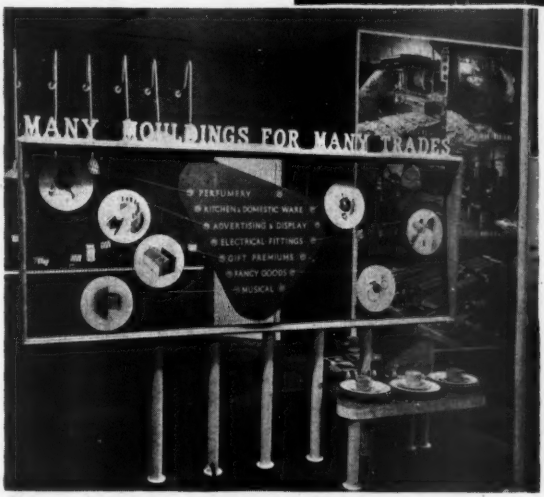
(Above) Hard p.v.c. for the chemical industry (tanks, ducts, pumps and even brushes) was shown by Tanks and Linings Ltd.

(Below) Universal Tools Ltd., as tool makers to the industry, show injection, compression and transfer moulds.





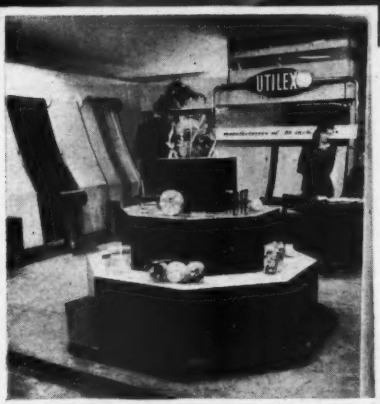
(Above) British Industrial Plastics Ltd. showed some excellent mouldings made by industry with their urea resins, e.g., radio cabinets, hair-driers, etc.; and (right) their adhesives and other products for foundry core-binding, paper, etc.



(Left) Streetly Manufacturing Co., Ltd., by photographs, designs and actual mouldings, showed what they are capable of in the way of electrical fittings, musical instruments, kitchen ware, advertising displays and fancy goods.

(Above and right) Erinoid Ltd., our friends from the West Country, cover many of the raw material requirements of the plastics industry —casein, acetate and p.v.c. moulding powders, in addition to sheeting and also extrusions.

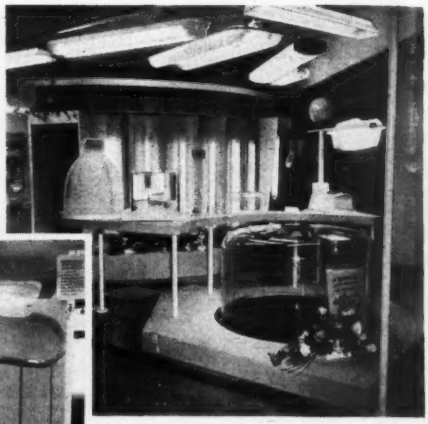
(Below) BX Plastics Ltd., another provider of raw material, sectionalized the uses of casein, acetate p.v.c. into industries: mouldings, sheetings insulation ("Isoflex"), packaging, etc.



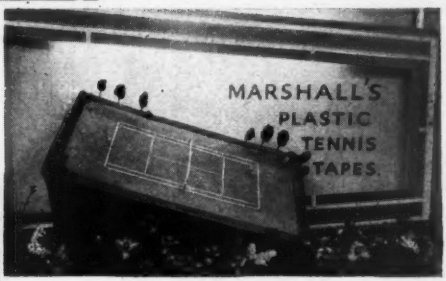
(Above) Utilex Ltd. Beautiful transparent containers—all the way!

(Above and right) Dufay-Chromex Ltd. specialize in acetate film for all types of packaging and display. The cellular paper-resin construction "Dufaylite," used in wall furniture building was also on show.

Triplex Safety Glass Co., Ltd., one of the largest manipulators of sheet thermoplastics in the country, showed excellent examples of aircraft, lighting and other components and (below) a niche in a kitchen, including sink cupboards and hand-basin, all in a delicate green shade of colour.

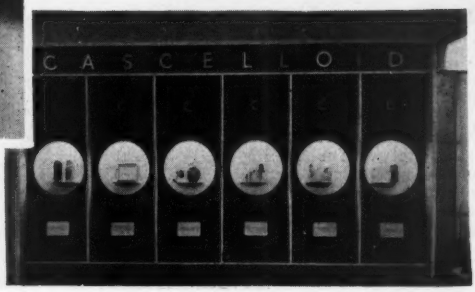


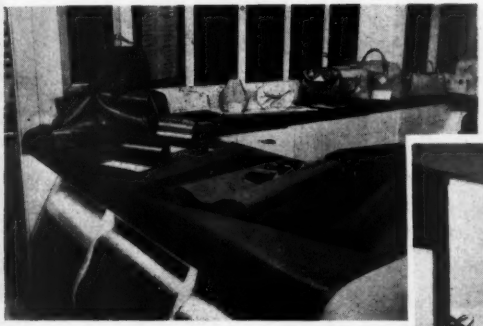
(Below) C. and C. Marshall Ltd. extrude p.v.c. for use as tennis court tapes that have long life, extrusions for motor-car wing piping, and thonging.



We have selected this chair as a perfect example of the use of printed p.v.c. (Bernard Wardle and Co., Ltd.) as furniture cover.

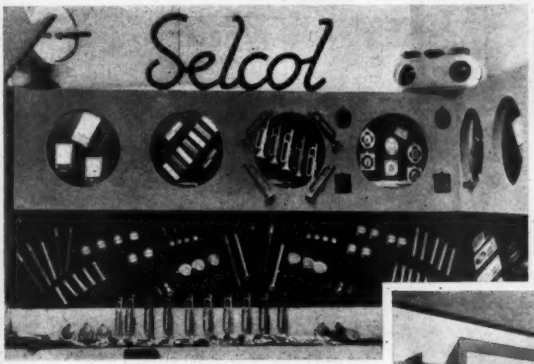
(Below) Cascelloid Ltd., one of the oldest and largest toy makers, showed a notable range of general mouldings in acetate, polythene, urea, etc.



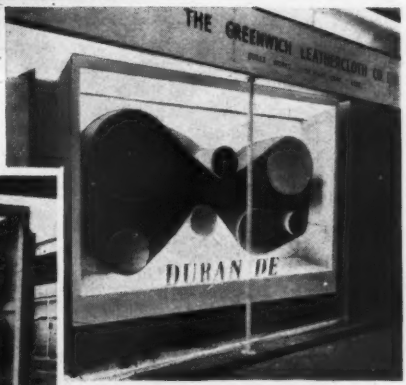


Great advances are noted in p.v.c. sheet, supported and unsupported. Arlington Plastics Development Ltd. (above).

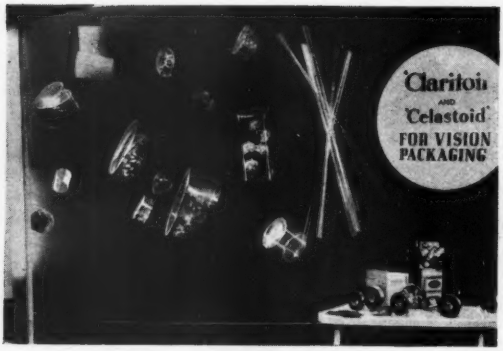
Duraplex (Plastics) Ltd. and Greenwich Leathercloth Co. Ltd. (below) deserve great commendation for the extraordinary progress made.



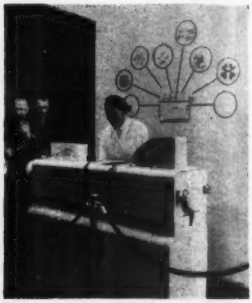
Henri Selmer Ltd., a newcomer to the Fair, specialized in musical toys.



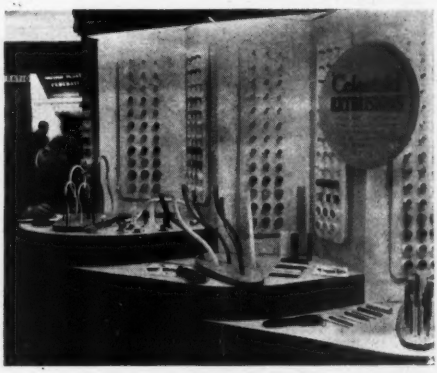
This progress was reflected in the great interest taken by buyers, and also in the wide adoption of this improved p.v.c. for making handbags, suitcases, etc.



'British Celanese' for vision packaging was the slogan here. A departure was the spiral-wound tubes, whilst—

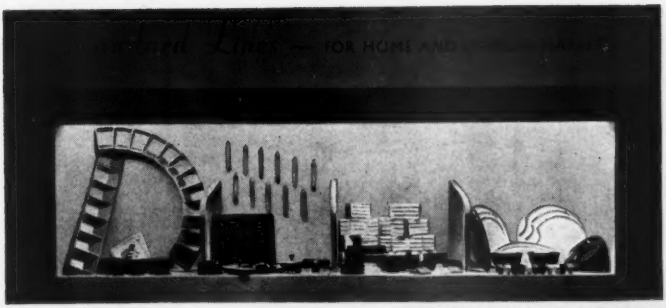


Hupfield's injection machine produced gift mouldings for visitors to the Fair.



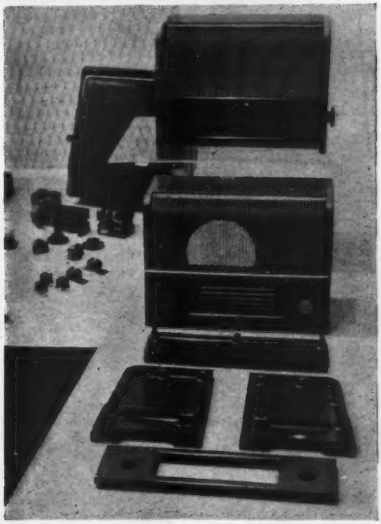
—here we have acetate extruded on to metal or other tubes, also British Celanese Ltd.

De La Rue Insulation Ltd. showed industrial and domestic laminates, including beautifully designed nursery furniture and ship and hotel lounge furniture.

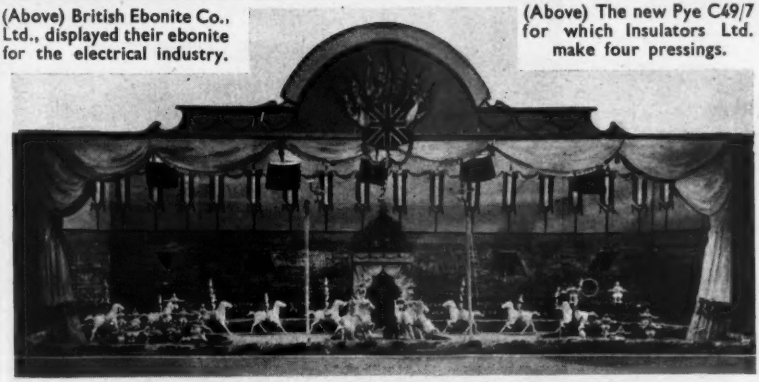


(Above) Insulators Ltd., showed both standard industrial lines and various specialities (see right).

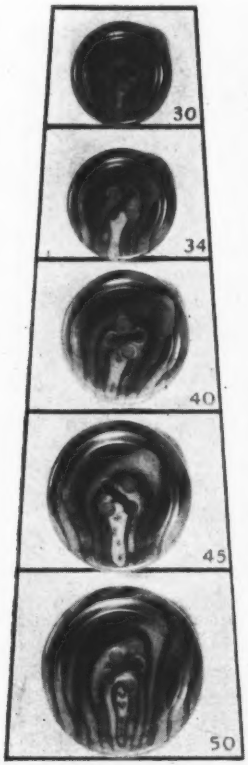
(Above) British Ebonite Co., Ltd., displayed their ebonite for the electrical industry.



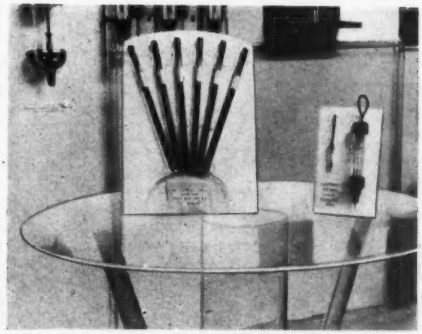
(Above) The new Pye C49/7 for which Insulators Ltd. make four pressings.



Fraser and Glass, Ltd., showed their toy circus of clowns and horses.

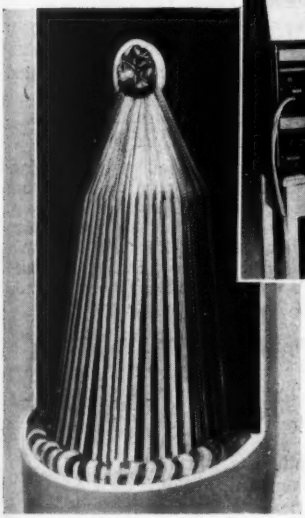


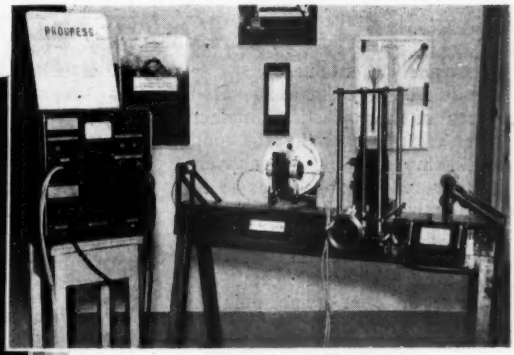
Buttons by Hornflowa Ltd. are now famous here and elsewhere. The beautiful copy of the Zambesi button is a new speciality.



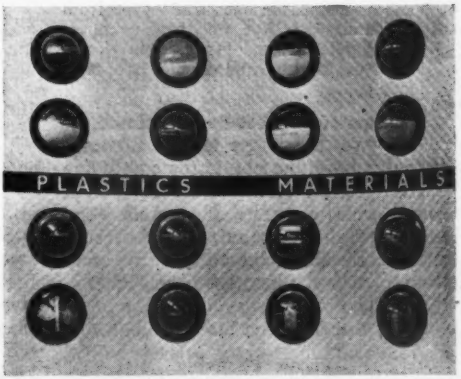
(Above) Evolite Plastics Ltd. Tubes of cellulose acetate for industrial uses were on view, including oil-viscosity tubes and a test lamp.

(Right) Uni-Tubes, Ltd. showed a full-scale unit for covering polythene tube with a protective metal spiral.

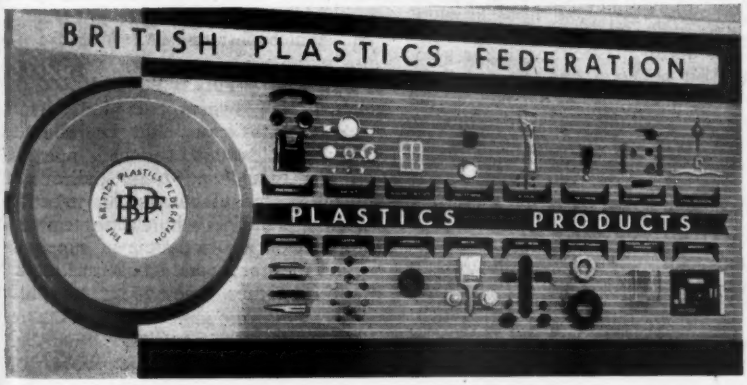




(Left and above) Duratube and Wire Ltd. show its new range of true multi-coloured extrusions and a new high-frequency excentricity gauge for wire covering its works are now using.



(Below and right) British Plastics Federation portray an excellent flow sheet showing what the industry produces from raw materials.



LETTERS TO THE EDITOR

Cosmetic Containers

Sir,—I would be very glad to hear from any concern offering plastic containers for a toilet cream, especially for tooth paste or shaving cream. Alternatively, if any of your readers have ideas so far not commercially developed for such containers, I would be glad to contact them, especially if such containers show some advantage over the usual metal collapsible tube, or offer some point of convenience or novelty.

POLDEN LABORATORIES.
15, Berrylands Road,
Surbiton, Surrey.

[EDITOR'S NOTE: The plastic tube of acetate was made over six years ago, although we have seen few on the market recently. In view of metal shortage, a new type from p.v.c. and, we believe, polythene is engaging several concerns very seriously, and interesting experimental samples have been made.]

Plastics for Embedding Specimens

Sir,—We are interested in a transparent cold-setting plastic for embedding small specimens, and would be glad if you would give us the names and addresses of the manufacturers of such material in England.

J. BRENNAN, D.Sc., Ph.D.
Lumite,
55, Upper Dorset Street, Dublin.

Plastic Thonging

Sir,—I am manufacturing leather handbags, and in the making up of which a large amount of plastic thonging is used. Would you be good enough to let me know the address in England of the makers of "Rotolac" plastic thonging, as my efforts to find this information have so far been unsuccessful.

N. R. STURGESS.
1304, South Street, Hatfield,
Pretoria, Transvaal.

[EDITOR'S NOTE: This plastic thonging is made by Rotolac, Ltd., Bridgewater Works, Timperley, Altrincham, Cheshire. A. S. Brewer and Co., Royal House, Montpelier, Cheltenham, are also makers of plastic thonging.]

Laminated Paper for Insulation

Sir,—We should be much obliged if you would let us have the names and addresses of manufacturers of laminated paper sheets for insulating purposes.

MODERN COMMODITIES, LTD.
23, Old Burlington Street, W.1.

[EDITOR'S NOTE: The following manufacturers should be able to help you: Bakelite, Ltd., 18, Grosvenor Gardens, S.W.1; Tufnol, Ltd., Wellhead Lane, Perry Bar, Birmingham, 22; De La Rue Insulation, Ltd., 84-86, Regent Street, W.1; and Moulded Components (Jablo), Ltd., Waddon Road, Croydon, Surrey.]

Spreading P.V.C. Paste

Sir,—We have an urgent request from Australia for manufacturers of spreading equipment for p.v.c. paste and lattices.

DEAKIN PARTNERS.
16, Copthall Gardens,
Twickenham, Middx.

[EDITOR'S NOTE: This type of equipment is made by John Downham and Co. (1927), Ltd., Barn Brook Iron Works, Bury, Lancs.]

Injection Moulding

Sir—May we ask you to let us know some important and productive English firms which are injection moulding polystyrene, cellulose acetate, nylon and polythene?

PLABAG,
Plastik und Bakelit A.-G.
Zurich,
Mühlebachstrasse 84.

Export Inquiry

Sir,—I am owner of a plastic hand-manipulating factory and interested to construct a section for hand-operated injection moulding. I am desirous of contacting manufacturers of injection-moulding machines with electric temperature control; also a source of supply of moulds (new or second-hand) for buttons, brooches, combs, fancy goods, toys, hair slides, etc.

A. KAMAL AFIFI.
Cairo (Egypt),
P.O.B. 2144.

Cellulose Acetate Plastics

XXI.—Printing and Decorative Finishing

By
Vivian Stannett

THE methods of finishing which are used for cellulose acetate plastics include printing, embossing, painting, transfers, stamping, engraving, etching, inlaying and metal plating. Some of these are restricted to sheet cellulose acetate, whereas others are also applicable to moulded products.

Printing

The main difficulties involved in printing acetate sheeting were due to the non-porous and non-resilient nature of its surface, whilst earlier types of film and sheet tended to exude an extremely slight but nevertheless troublesome film of plasticizer which caused smudging and other printing headaches. Fortunately, this latter trouble has now been completely overcome by the acetate sheet manufacturers themselves.

The difficulties arising from the non-porous, non-resilient character of the plastic have been mastered by the production of suitable inks which are extremely fast drying and often include volatile solvents in their composition. With the use of these special inks, cellulose acetate can now be printed, using most of the commercial printing techniques, such as intaglio, letter press, aniline, lithography and rotogravure.

For small-scale work, ordinary small commercial offset or direct miniature printing machines can be used, and make a very satisfactory printing job, assuming good quality blocks, and particularly when a good grade of suitable ink is used. For large-scale work, good commercial printers can handle either roll or cut sheeting for printing by high-speed offset processes; a number of printing concerns have now specialized in this type of work. Even thickness and very flat sheeting are essential for the smooth operation of high-speed automatic printing machines, and often commercial grade acetate film and sheet give some trouble to printers used to the comparatively uniform batches of paper blanks. However, with a little co-operation between the printer and the plastic manufacturer, difficulties can be ironed out, and the high-speed printing of cellulose acetate sheet can become as routine as paper printing.

A slightly rough or matted surface takes the print better; unpolished or knife-cut finish, or sheet with one side only polished, are often used. When the costs will allow, it is advantageous to polish the sheeting after printing by hot pressing between highly polished metal plates in a hydraulic daylight press. When this is to be done, inks which are resistant to heat and immune from any tendency to bleed into the plasticizer must be used. A very good lustre and finish are given to the printed sheet by this method, the print appearing to be deeply embedded in the plastic. Heavy printing on transparent sheet is very effective when carried out in this way.

For special uses, a printed sheet is sometimes laminated to a transparent sheet to give complete embedding of the print between two layers of plastic; again, a printed sheet can be sprayed with transparent lacquer if extra protection is needed, although modern good-quality inks give a very firm and wear-resistant adhesion to the cellulose acetate sheet. All colours, including gold and silver finishes, can be printed on cellulose acetate, and although close-register work is rather more difficult than with paper printing, up to at least five-colour designs can be successfully printed using normal multi-colour technique, although, here especially, very uniform quality sheeting is essential.

Silk Screen Printing

Silk screen printing falls more into the category of a stencilling rather than a printing process. The principal of the method is to use a flat screen of silk mesh on which the marking part of the stencil is deposited. The mesh support can be made of materials other than silk; for example, brass and stainless steel are also sometimes used. The mesh size can vary from say, 60 to 220 threads per inch. The stencil mask is made of gelatine or of a suitable grade of lacquer. The screen is placed over the plastic sheet, and special grade ink is applied to it, using a rubber squeegee device. In this way the blanked-out design is applied to the sheeting. Multi-coloured effects are produced by using a succession of screens carrying the appropriate design.

Many ingenious methods, including photographic, have been devised to transfer the exact shape of stencil to the screen, and an extraordinary fidelity of detail can now be obtained. For example, the fine lace pattern printed on to transparent plastic table mats are usually made using the silk screen process. In addition, a very high rate of production can be achieved; this may go up to nearly 1,000 pieces per hour for simple shapes. Furthermore, fully and semi-automatic processes of considerably faster rates have been developed.

As with orthodox printing work, the tendency is for manufacturers to send their work out to companies specializing in silk screen work, rather than to undertake the work themselves. The depth of colour, brightness of finish, and adhesion of the pattern depend largely on the quality of the ink used for cellulose acetate plastics; volatile solvent type inks are frequently used and give the best adhesive properties.

Stamping

This process is usually a combination of stamping and printing; it yields a very permanent and effective design. The normal method is the so-called roll leaf hot stamping process. This involves the stamping and printing together as one operation, no drying time is required, and the plastic object is ready for packing and dispatch when stamped.

The stamping machine is arranged to bring down the heated steel or brass dies or type on to the plastic. A strip of specially thin stamping foil, usually paper backed, is run from a feeding reel between the die and the plastic. As each stamping is made, a fresh portion of the foil moves under the die ready for the next operation. All colours of foil are available. The hot die transfers the colour from the foil to the indentated design on the plastic. A variety of commercial hot leaf stamping machines are available, and vary from inexpensive hand machines to elaborate high-speed fully automatic machines. The marking foil is available in all colours, and both the foils and the dies are not too expensive.

This type of marking is carried out normally by the plastics manufacturers themselves. It is especially suitable for trade marks and identification labelling, or for stamping simple designs such as leaves, crowns, etc. Another common use for this process is for the production of transparent name tags, when the name is stamped in reverse on the plastic sheet to give complete protection of the print. If necessary, the print can be sealed in for protection with a little transparent lacquer.

Etching

Although not widely used, the etching of cellulose acetate plastics by means of acid or alkali yields a very permanent mark; in fact, it is one of the most permanent of all marking methods. The process is exactly the same as metal or glass etching; the surface is coated with wax, pitch, or similar resistant coating, and the design to be etched is shaped by the removal of the wax. The part is then cleaned with alcohol, and immersed in acid or alkali for a short period of time, followed by washing and cleaning off the surplus wax. A good etching fluid for cellulose acetate is 25 to 30 per cent. caustic potash solution. The design can,

of course, be etched or highlighted in an etched background, and, if necessary, the etched portion can be coloured before removing the wax.

Other methods of marking cellulose acetate include engraving, using rotary cutters guided by pantographic tracer, sandblasting through a stencil, and straight stencilling, using a spray or brush. Finishing is often done by hand painting; fabricated articles, such as blown dolls' heads or lampshades, are often coloured by a combination of spray and hand painting. Normal nitrocellulose brushing and spray lacquers give a good adhesion to cellulose acetate and are often used for this type of work.

A further method of decoration very suitable for cellulose acetate is by means of paint transfers or paper transfers with specially suitable adhesives.

Embossing

Embossing is essentially a shallow forming process and is very common with cellulose acetate sheeting of above 5/1000 in. thickness. Most sheeting manufacturers keep from 10 to 20 standard embossing designs, so that embossed sheet can usually be supplied as a standard order. There are two main methods of carrying out the embossing; the continuous method is adapted for continuously cast or extruded film, the discontinuous is used for skived sheeting.

The former method has been adapted from heavy paper-forming machinery, as used for heavy embossed wallpaper. The film is led from a friction-restrained fed reel over guide rollers and through a pair of special rollers, one of which is of steel, having its surface engraved or otherwise imprinted with the reverse of the design to be embossed. The other roll is coated with some firm but resilient covering, such as paper composition or a special grade of hardened rubber. The steel roller is steam or electrically heated, and under the pressure and heat of the rolls the pattern is faithfully reproduced on the plastic sheeting.

From the embossing rolls the sheeting is led round further guide rolls and either rewound or cut into suitable lengths. This type of embossing is by far the most efficient and a very high rate of production can be maintained. However, it has the drawback that it is really only suitable for continuous lengths of reeled plastic sheet. Formerly, only manufactured in Germany and the U.S.A., these continuous embossing machines are now being manufactured in the United Kingdom.

The other method of embossing is normally used only for skived sheets as produced by the block process. It consists of placing the unpolished plastic sheet between embossed steel plates and subjecting the set-up to heat and pressure, using a hydraulic daylight press; this impresses the design from the plate on to the plastic. A large number of assemblies of plastic and embossed steel sheets can be built up between each daylight, and consequently a reasonable rate of production can be achieved.

Alternatively, a quick-acting toggle press with heated platens can be substituted for a hydraulic press, and in this case the plastic sheets can be preheated before pressing. The higher speed with this type of press is, however, partly offset by the fact that only one sheet at a time is usually embossed. The life of the embossing plates is rather limited, but, on the other hand, a larger variety of standard designs can be kept on hand by the manufacturers, owing to the "mould" (in this case the steel sheet) being much cheaper than the engraved rollers as used in the continuous method.

Metal Plating

The successful application of a polished metal coating to cellulose acetate plastics was an important step in the full development of this material, and it led immediately to a considerable extension of its range of uses. The importance of metal plating from the viewpoint of decoration is obvious in view of the wide use of the material in the fancy goods and packaging trades. In addition, metal plating opens up the way to its use in the electrical industry and for light reflectors.

Better strength as well as improved resistance to heat and water is also imparted to the product for any specialized purposes for which it might be worth while.

Mass production methods of metal plating cellulose acetate sheeting and moulded objects are already in use and although the initial plant is somewhat expensive, once it is installed, it is found to be a very cheap process and does not materially increase the cost.

A number of different methods of metal plating cellulose acetate have been described and patented, but currently only two methods appear to be used on a commercial manufacturing scale. These are the electroplating method and the vacuum deposition method. The electroplating process is usually preceded by an initial metal coating made by chemical means, such as the deposition of a thin coat of silver by chemical reduction. The plastic must first be cleaned very carefully and then sensitized by means of a solution, which often includes stannous chloride in its composition. The plastic object is then silvered with a mixture of fresh ammoniacal silver nitrate plus a reducing solution. These can be sprayed on or applied by simply immersing the article to be plated. A great number of variations involving several solutions have been described and patented, and each plater probably has his own particular composition.

By a similar process, a basic covering of other metals, such as nickel and copper, can also be made. An alternative method of undercoating prior to electroplating is by using special conducting silver paints but the chemical reduction method is the most widely used at present. Once the first deposit has been made by one of these methods, the electroplating itself follows closely on standard methods especially for small moulded objects and the like. The plating takes about five to seven hours and a comparatively heavy coating of 7 to 15 thousandths of an inch is often deposited. Owing to the nature of cellulose acetate, it is not possible to use hot baths or highly acid or alkaline plating solutions.

Like many operations in the plastics industry, acetate plating has become very specialized and most manufacturers send their products out to companies who only do this type of work. Very few companies exist, however, which, at the moment, specialize in plating plastics; the exacting nature of the process must be emphasized, that is, to give a permanent coat of good finish.

Vacuum Deposition

The vacuum deposition technique for the metal plating of plastics was developed in the U.S.A. during the war, and has now become a very well established industrial method. It has the advantage that a very thin coat only has to be deposited in order to give a perfect mirror finish, and this makes the process much cheaper than electroplating techniques.

Essentially the process consists of resting the plastic sheet or object a few inches from the metal source in a chamber, which is then evacuated down to a very low pressure of the order of 10^{-5} mm. of mercury. The metal is then heated, when it vaporizes and deposits on to the plastic surface as a very fine layer. The metal can either be heated in a small crucible or wound in the form of a wire round a filament of tungsten or molybdenum which is then heated electrically. With a correct balance of vacuum and heat, the deposit is made in a few seconds. Most of the time is taken up in evacuating the chamber, but 10 to 15 minutes is all the time needed for a complete production cycle.

Many metals can be deposited by this technique, including copper, aluminium, gold, silver, chromium, cadmium, zinc, nickel and tin. A very smooth and mirror-like finish is obtained. Owing to the high vacuum employed, however, a carefully plasticized cellulose acetate must be used, otherwise the process is spoiled owing to the plasticizer evaporating out from the plastic. The mirror which is deposited faithfully reproduces

the surface of the plastic, so that the higher the polish, the better the mirror.

Machines are available in the U.S.A. to carry out this work, the largest of which will handle continuous 24-in.-wide reels of cellulose acetate sheet, depositing a metal mirror at the rate of about 35,000 ft. per 24 hours; smaller discontinuous machines produce something like 1 per cent. of this production rate. Continuous lengths of thin metallized cellulose acetate film find extensive use already for stamping into sequins and for packaging.

Inlays

The use of metal inlays in cellulose acetate, or, indeed, any type of plastic, has not yet been exploited here to a large extent, although in the U.S.A. a number of beautiful metal inlayed plastic mouldings, such as automobile and radio fittings, are in regular production. The inlays are produced by a variety of patented methods.

The so-called "surface inlaying" is carried out by the following sequence of operations. A recess is pressed or moulded into the plastic and into it the same shaped piece of metal is inserted. On top of this, the thin metal inlay, which is slightly concave in shape, is placed. Pressure is then applied to the inlay, when it squeezes into the plastic walls of the recess, fixing it firmly in position to give a permanent and effective seal. Two different coloured metals with stencilled-out design can be used for special effects. The inlay can also be reversed with transparent plastics, i.e., the recess can be in the base of the plastic and observed from the reverse side.

A further method is to mould extra materials as an excess round the edges of the cavity and fix the inlay by melting this excess over the edges of the inlay. Finally, an alternative method is to simply seal the metal into the cavity by placing a piece of transparent plastic over it and welding the two plastic parts together.

(To be continued.)

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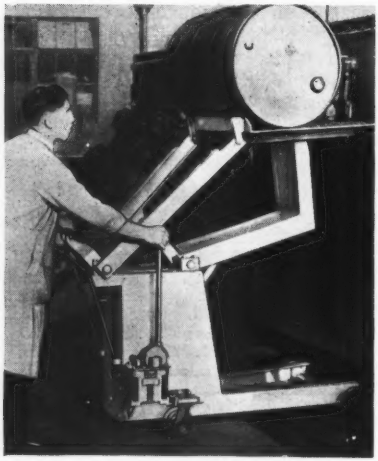
PACKAGING MATERIALS. — An exhibition of flexible packaging materials, organized jointly by the Council of Industrial Design, the Institute of Packaging and the Printing, Packaging and Allied Trades Research Association, opened at Murray House, Petty France, London, S.W.1, on May 3. It will close on May 31. The present display is concerned only with flexible packaging materials, and representative samples from over 60 firms are being shown under such headings as protective papers and sealing materials, metal foils and collapsible tubing, plastic materials, protective chemicals and adhesives. Some finished packages are also shown to illustrate the use of the raw materials. The exhibition is presented as the second in a series of small technical displays which are intended to provide a service to industry and to serve as a pointer to the kind of work which industries could do for themselves in design centres. Visitors to the exhibition will be welcomed by Major Charles W. Cousland, who has recently been appointed to the staff of the Council of Industrial Design as packaging officer.

PRODUCTION NEWS

Raw Materials, New Plant, Works Organization, Control Apparatus, Research, Personal and Trade Notes



PORTABLE LIFTING TRUCK.—The Newton "Hydratruck," here illustrated, has evolved from a definite need in the maker's own works. They have, therefore, had the opportunity of studying the design under actual working conditions. The original purpose of the truck was to speed up, and simplify, the handling of press tools between stores and machines, but other jobs which had previously been done by hand, or with block and tackle, came within its scope.

In its present form the truck will handle loads up to half a ton, with a great saving in time and effort. It is small enough to be easily manœuvred in stores and machine shop gangways. The maximum load capacity is 10 cwt., but the truck is actually proof-loaded to 12½ cwt. and guaranteed for six months.

The platform, 30 ins. by 30 ins., is raised to its maximum height in under a minute, and descends at a controlled speed which cannot be exceeded in any circumstances. The lifting range is 7 ins. minimum, 56 ins. maximum: 55 strokes on the pump handle are needed to raise the platform to its maximum height (approximate time one minute). Normally the platform descends in about 20 seconds, but in the unlikely event of a failure of the hydraulic system, the platform cannot crash down, as a control valve within the body of the lifting ram controls the descent to a safe maximum. The makers are Power Jacks, Ltd., Valetta Road, Acton, W.3.

NEW MOULDING MATERIAL.—Development of a new faster-curing moulding material is announced by Bakelite, Ltd., under grade reference X.50. The practical effect of this technical advance is that more mouldings can be produced from the same mould in a given time, thus lowering overall costs and increasing output. It is difficult to quote firm figures for the speeding up of the cure time, since this is dependent on the nature and size of the moulding. In general, however, practical experience shows there is a very important decrease in curing time relative to standard materials. Samples of X.50 can be obtained on application to any one of the Sales Offices of Bakelite, Ltd.

FIRE RESISTANT PLASTICS.—In connection with the L.C.C. regulations on fire resistance of materials, various grades of cellulose acetate, polyvinyl chloride and laminated materials have been submitted to the L.C.C., through Olympia, Ltd., and Earls Court, Ltd., for testing. The British Plastics Federation inform us that the result of these tests have only recently become known, and grades of those materials which have been approved by the L.C.C. may be obtained from Bakelite, Ltd., P. B. Cow and Co., Ltd., Dufay-Chromex, Ltd., Ferodo, Ltd., Holoplast, Ltd., Metropolitan Plywood Co., Wallington, Weston and Co., Ltd., and Vinyl Products, Ltd.

THOMAS DE LA RUE AND CO., LTD., announce that as a result of their recent re-centralization policy, the business of their two wholly owned plastics subsidiaries, De La Rue Insulation, Ltd., and Hill, Norman and Beard Plastics, Ltd., has been transferred to the parent company and both businesses will, as from April 1, 1949, in consequence operate as the Plastics Division of Thomas De La Rue and Co., Ltd. Apart from this change of status, the continuity of the businesses will be unaffected, and no changes of personnel will be involved. The two remaining plastics companies in this group, De La Rue Extrusions, Ltd., and De La Rue Floors and Furnishings, Ltd.,

will continue as previously, due to the fact that they are not wholly owned subsidiaries of the parent company.

THE MICANITE AND INSULATORS CO., LTD., Walthamstow, London, E.17, have opened a district office at 12, Eldon Square, Newcastle-on-Tyne (Telephone: Newcastle 25920), under the management of Mr. F. Saunders, who has been appointed sales representative for the company in Northumberland, Durham, Cumberland, Westmorland, and the North and East Ridings of Yorkshire. It is also announced that Mr. O. S. Upton, A.M.I.E.E., has been appointed sales representative for the London area and South of England generally, in succession to Mr. S. C. Jager, A.M.I.E.E., who is retiring at the end of April for health reasons. Mr. Upton was previously with W. T. Henley's Telegraph Works Co., Ltd., for 20 years.

"FABLON" P.V.C. SHEETING.—Commercial Plastics, Ltd., state that "Fablon" sheeting is supplied in widths up to 54 ins., and not 53 ins. as stated in their advertisement in the April issue.

REED BROTHERS (ENGINEERING), LTD., recently decided to have additional office accommodation built at their Millwall Works and to amalgamate all their staff under one roof. Their future address for all communications will be Replant Works, Cuba Street, Millwall, London, E.14. (Telephone: East 4081-5.)

E. I. DU PONT DE NEMOURS AND CO., Wilmington, Delaware, U.S.A., are to place their new plastic "Teflon" on the market in 1950. This product is claimed to withstand temperatures of 550-575 degrees F. and resist all acids.

MR. REG. ALLSOP advises us that he is severing his connection with John Dickinson and Co., Ltd. He has been with the company for nearly 30 years and was associated with plastics and Croxley fountain pen manufactures at Kirkby, Llverpool. Mr. Allsop has not yet decided his future plans. His temporary home address is "The Knowle," Blundellsands Road West, Blundellsands, Liverpool.

OBITUARY.—We regret to announce the death on March 31 of Dr. Willard Dow, president of the Dow Chemical Co., and his wife in an aircraft crash near London, Ontario. They were on their way to Boston to hear Mr. Churchill's speech. Dr. Dow will be missed by a very large circle of friends in this country.

S.P.I. ANNUAL CONFERENCE will be held at Edgewater Beach Hotel, Chicago, Illinois, May 26 and 27. There will be technical meetings of the following groups: Injection moulders, fabricators, compression moulders, extruders, film and sheeting, and tool, die and machinery.

PLASTICS INDUSTRY GOLFING.—A feature of the opening meeting of the Plastics Industry Golfing Society at West Hill Golf Club on April 7 was a new competition for the "Plastics" Goblets presented by Mr. R. E. Dangerfield, chairman and managing director of Temple Press Ltd. The accompanying illustration shows one of the goblets.

These goblets are to be won outright each year by foursome played against bogey. The winners were Mr. D. Sullivan (De La Rue Extrusions, Ltd.) and Mr. Forbes Maclean (advertising manager, "Plastics"). The runners-up were Mr. J. R. Severn (British Artid Plastics, Ltd.) and Mr. K. G. Butcher (Bakelite, Ltd.).

In making the presentation, in the evening, Mr. Dangerfield congratulated the Society on the large attendance of members and their obvious enthusiasm.

Play also took place against bogey for the "Airborne" Trophy, presented by Mr. John Ferguson. This was won by Mr. J. R. Severn and the runners-up were Mr. T. S. Crabtree (Arrow Electric Switches, Ltd.) and Mr. P. Chaumeton (Ermoid, Ltd.).

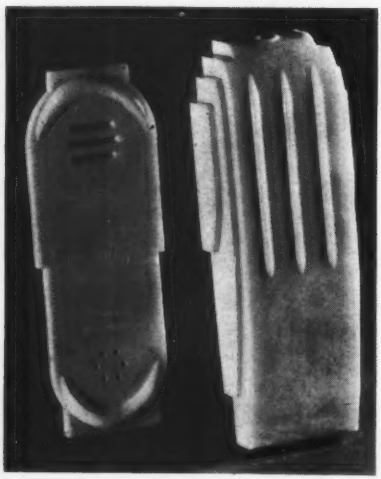
New Productions from the Moulding Shops

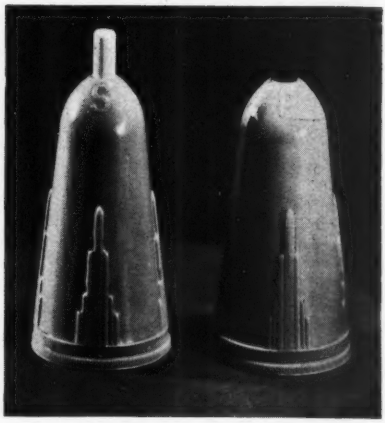
Display Case

Made for Baume and Co., Hatton Garden, London, this display case to be used in connection with the sale of Longines watches is moulded in urea and phenolic by Crystalate, Ltd. The design is elegant, and the flock-sprayed phenolic platform on which the watch is placed is an unusual feature.

Internal Telephone

An attractive, unbreakable, streamlined case in polythene is used as a housing for the " Intercall " telephone by E. Shipton and Co., Ltd., Ferndown, Northwood Hills, Middx. As this instrument is normally mounted upon the office wall, any risk of breakage by dropping the combined receiver and transmitter, when lifting or replacing, is absolutely nil. The polythene case is of light weight, yet fully robust. It is available in a wide range of colours to harmonize with surroundings.



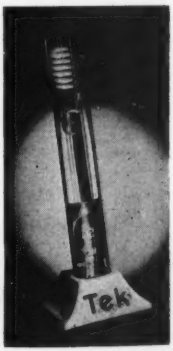


Salt and Pepper Containers

These containers for salt and pepper function in an unconventional manner. On pressing the button at the top, the contents emerge through a spring valve in the base of the container. The base unscrews for ease of refilling. They are injection moulded in cellulose acetate of a pastel shade and were exhibited at the 1949 B.I.F. by Mendle Brothers, Ltd., Station Terrace, Pontygwaithe, Rhondda, Glam.

New Pack

The new pack now on the market for " Tek " toothbrushes is seamless and wholly transparent with a red slip-on cap. Made by De La Rue Extrusions, Ltd., at their Tynemouth factory, the container is a rigid and permanently hygienic receptacle for both marketing and carrying the toothbrush while travelling. It is ribbed for strength, and carries a small label on the inside surface.



Testing and Proving Injection Moulds Prior to Production

By W. M. Halliday

In this article the author describes the several important advantages and economies to be derived from having a separate department, and personnel where permissible, devoted to the task of proving new injection moulds prior to being issued to the production shop for regular use.

BEFORE a newly constructed injection mould can be fully completed to the stage of being satisfactory for production use, the toolmaker will have to settle quite a number of problems surrounding certain features of its construction, operation and general usage. Usually these problems can only be conveniently and reliably resolved by mounting the mould upon the injection machine to take a number of trial shots under conditions closely akin to those under which the mould will have to operate when issued to the production shop.

Some of the chief matters to be settled at this stage of the mould development are here enumerated in order to illustrate the extensive and important nature of problems when they are considered in combination, together with indications of the extent of toolmaking attention needed.

Feeding the Mould

First of all the toolmaker will have to ensure that the runner and gating system is made adequate to feed the cavities in order to produce full mouldings. It is customary toolmaking practice with every new injection mould to cut runners to a standard depth and width, and gates of not more than .015 in. to .020 in. deep, and of limited width. These shallow gates are then deepened or extended in width as circumstances demand, as indicated by the condition of the mouldings produced during these trial runs.

Sometimes, too, the runners may have to be altered either in direction or area to give a different direction to the flow of plastic material, or greater volume of same. To allow for this they also are cut on the shallow side.

Determination of these points with a complex mould design, having, say, 20 or 30 impressions to be fed, may entail a considerable amount of time in making the necessary number of trials and runner-gate alterations.

Checking Dimensions and Shape

Having arrived at the correct gating system for the mould, the next point to be settled relates to the dimensional accuracy and general contours of the moulding. These are checked up carefully in reference to the component drawing. The usual practice is to ensure that the moulded article agrees with the blueprint in *every respect*, both as to dimensional tolerances, surface finish, shape, weight, or any other qualities stipulated.

Obtaining such satisfactory mouldings very often requires repolishing operations upon the walls of the mould cavity, or the reduction of some core member, or again, the slight increase in the diameter of some recessed portion of the mould which has been found to be moulding the part too small in diameter. Numerous minor toolmaking errors *must be watched for and corrected at this stage.*

Here again it will be understood that a considerable amount of time and skill may have to be expended before the toolmaker at last secures a moulded article sufficiently accurate, and which faithfully tallies in every respect with the sample component or drawing.

Sprue Stalk Pull-out

This accomplished, a number of such mouldings will be made, inspected thoroughly, and dispatched to the client for his consideration and acceptance.

The moulding of such sample articles would then proceed in order to determine

several other essential items of information. Thus the toolmaker would have to check the facility of the sprue pull-out for the waste stalk moulded on each spray of parts. Very often it happens that this stalk sticks in the sprue channel due to the latter being of insufficient taper, or not smooth enough in surface finish, or too small at the nozzle end of the mould block.

In overcoming such difficulties the mould may have to be removed several times from the machine to polish up the sprue channel or to modify the dovetail key end of the pull-out rod.

Proper Ejection

The next important feature to be considered at this trial stage is that of ejection. Very often with the manufacture of a new mould the toolmaker is unable to determine with exactitude just which is the best position for locating some of the ejector pins. This can often be readily settled by seeing a few mouldings actually made in the mould, and observing from such trials where the points of sticking or greatest resistance exist.

Thus, removal of the mould block may be necessary in order to equip it with its full complement of ejector pins or to modify the size, length of stroke, etc., of some of those originally installed.

Attention will also be required at this juncture to the means for guiding the ejector rail to ensure these are adequate to withstand the wear and tear of repeated production from the mould. In respect of this portion of the mould mechanism it will often be found advisable to enlarge the guide pillars or to allow the rail slightly more or less travel, etc.

With moulds for producing thin-walled components of intricate contour the task of ejection from the mould may give rise to some very awkward troubles in the shape of distortion, cracking, or complete breakage of the parts at some point.

Ease and safety of ejection will also have to be ensured during the trial stages, and here again innumerable snags may arise, the overcoming of which will involve repeated removal of the moulding from the injection machine for slight modifications here and alterations there, which of themselves are only slight machining or hand adjusting operations requiring but a short time, the bulk of the delay usually occurs in respect of the elucidation, and consideration of the best means for overcoming the difficulty.

As many toolmakers will know, all this may involve quite a protracted length of time and not a few worries for the persons charged with completing the trials of the mould.

Mould Temperatures and Working Conditions

The next essential point to be ascertained from these trials is that of the most suitable working temperature and other conditions for the mould. Naturally, this will vary to some extent with every mould, since each such tool is a unique construction, and it is highly desirable that such conditions be determined, and if possible completely stabilized before the mould is issued to the production shop.

With intricate and complicated mould mechanisms this may involve not a little trouble, because it then becomes even more vital that the correct moulding sequence be worked out faithfully *beforehand* for the guidance of the machine operator at a later stage when production is reached.

Where the mould has to be hand fed with insert parts, or when a number of cores have to be withdrawn manually or semi-automatically, the difficulties in the way of developing a smooth, reliable sequence of movements for the operation of the mould will be increased, and the task of the toolmaker testing the mould will also be similarly involved.

Smooth Working and Correct Timing of Mechanism

Verifications will also have to be made that every portion of the mechanism is capable of functioning correctly at the proper speed, and without interference

with the rest of the mould mechanism.

Correct timing for all stages of the operation will also be worked out during the trials, so that once the mould is handed over to the production engineer full data can be given to him as to the time for closing the mould, the length of dwell to be effected before opening, and the time allowable for ejection, in addition to the temperature for working the mould and the degree of water cooling, etc., required for best results.

Air Vent Provisions

Another very important problem to be solved at this stage is that of the provision of appropriate air venting channels to permit expulsion of air from the mould, so preventing the formation of air pockets within cavities, etc., and resultant faulty moulded parts.

From the few sample mouldings obtained during these trials, examination may reveal the need for and the preferable location of such air vent channels across the mould block surfaces or other members of the mechanism. This is a matter which can only be settled from observation of actual moulding operations and checking of components produced, so as to discover at which points air voids are being formed.

With moulded components possessing deep hollow recesses or holes, it will often be necessary and, indeed, preferable to provide air-escape channels upon the shanks or within the core members of the mould, as this usually offers the best prospects of satisfactory evacuation of air likely to be otherwise trapped.

Such requirements as these obviously must entail a number of trial shots being taken from the mould, and eventually its removal for complete or partial dismantling in order to permit such machining of air-venting channels to be effected.

Hardening Requirements

Such practical testing of the mould mechanism also very often indicates the need for hardening or not hardening certain portions of the mould. Certain hole dimensions may be found to be too close in the amount of working clearance afforded to the mating member to ensure easy operation when the parts are hardened. Much useful experience will be gained from this initial operation and testing of the mould, which will prove of assistance to the toolmaker and hardening department.

Comparison of Actual and Estimated Moulding Time

A further very essential point to be ascertained during this first try-out of a new mould is that of comparing the time required for performing the actual moulding cycle with the estimated times used as a basis for originally pricing the job to both client and works.

Once all the previous-mentioned points have been satisfactorily cleared up the mould tester should be in a position to say just how long each moulding cycle should take. More will be discussed later on this important aspect of mould usage, but it is worth while mentioning here that very often the small-sized moulding firm tends to overlook the need for making such a comparison between actual and estimated times—at the early stages, at any rate. All too often this check-up is deferred until production has progressed for an appreciable time, and in some instances it is never undertaken seriously, due to lack of time or oversight.

Such omissions or failures might lead to considerable losses, due to diminished production, if the actual moulding time is substantially longer than that estimated, which, indeed, may make the difference between a profitable or unprofitable handling of the whole job.

The present author has on several recent occasions found it necessary to check up an actual moulding production cycle which had never been compared with the estimated time at the outset of the production run. In one noteworthy case there was a considerable discrepancy between these two time ratings, on the wrong side. Examination of the mould and moulding methods revealed certain minor deficiencies which could easily be corrected, making it possible for the estimated production time to be very readily

attainable. Only three small adjustments in the mould mechanism and one slight alteration in the sequence of movements for operating the mould were, in fact, required. These points should, and could, have been discovered and altered at the proving of the mould, but no proper proving had been conducted.

This initial try-out of the new mould is naturally the most suitable stage at which these points should be determined, because it means that when production is commenced it can be started off in a proper manner, with the mould properly adjusted and attuned for producing articles within the estimated times allocated to the job.

If the estimated time cannot be attained after the mould has been proved and made as efficient as possible, justifiable reasons should then be advanced and passed along to the design and estimating departments. In such circumstances it may well happen that the price secured for the work makes it imperative for the estimated times to be reached, hence the designer will institute a check up of the design and construction generally in order to ascertain what improvements can be made to that end.

It will prove far more economical to discover such drawbacks and to evolve remedies at this stage than later, when the mould has been passed over to the production shops, where there would be a danger of the point being overlooked or deferred, since an interruption to the production procedure would be incurred, and often the necessary time for withdrawing the tool from use cannot be spared.

Inspection

The satisfactory moulded articles secured as a result of these trials of the mould would then be passed to the inspection department for rigid checking in every respect. This would give official confirmation that the parts were in order. Incidentally, in many small works such a decision is taken by one individual who happens to be testing out the mould, a practice which sometimes leads to trouble and disagreements about the responsibility for mistakes and omissions or wrong decisions respecting the correctness or otherwise of certain sample moulded components.

Checking Subsidiary Machining Operations on Moulded Parts

The mouldings should next be passed through all the subsequent operations, such as flash removal, dressing off, trimming, drilling, tapping, assembling, etc. All fixtures, tools and equipment required for such subsidiary operations should be carefully tested and any deficiences, peculiarities or ways of improving same should be duly reported to the toolroom foreman or designer, so enabling provisions to be made for corrections in readiness for the commencement of moulding production proper.

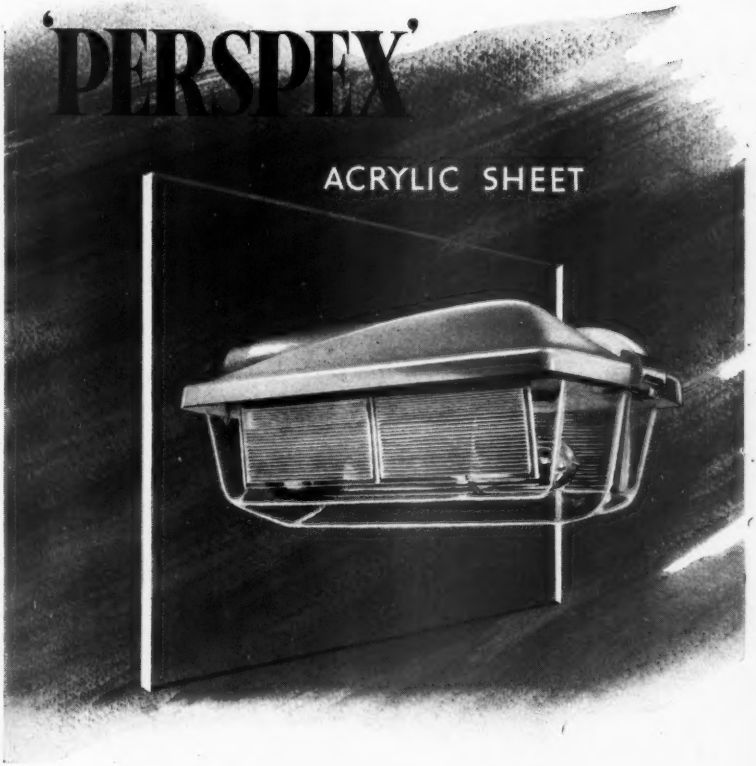
Damage in the way of distortion, bending or weakening is sometimes inflicted upon a moulding at one of the subsequent machining or assembling operations. For this reason alone, all fixtures and jigs should be rigorously tested at the outset to ensure complete safety to the moulded component.

Again, with most plastic moulding specified production times will have been estimated for all such operations secondary to actual moulding production, and it should be the duty of the mould tester to ensure that the time actually taken to perform each of these operations is within that estimated.

Vital Data of Mould and Operation to be Permanently Available

Certain vital information will be elicited during, and resulting from, these trials of the mould which it is advisable shall be permanently made available for the guidance of moulders, mould setter and maintenance toolmakers. Preferably, such information should be stamped upon the mould block or contained on an engraved plate securely affixed thereto.

In this way effective and permanent guidance or confirmation would be afforded to those persons vitally interested throughout the working life of



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the mould. This information will generally comprise the following points: (a) Weight of moulded parts, (b) depth of runner and gates, (c) working temperature of the mould, (d) length of moulding cycle, particularly the duration of dwell before ejecting the finished mouldings, (e) sizes of cores or recesses in the cavity for forming critical dimensions on the finished part. Sizes would, of course, include the shrinkage allowances applicable to the mould and material and would prove invaluable in time-saving and convenience to the maintenance toolmaker at some future date having to replace such parts. Without this information the cores would have to be made large or the recess small in diameter to permit further slight amounts of stock to be removed if found necessary after moulding a few parts.

Information as to the nature of the material from which important parts are made should be stamped on the mould for the better guidance of the toolmaker charged with future repairs, so avoiding troubles due to use of unsuitable materials.

Value of Separate Mould Proving Section

The author has described some of the chief items to be elucidated during the try-out of an injection mould, which, by the way, must be determined at some stage before the mould can be adjudged ready for effective production service.

Now it has become customary practice with very large plastic-moulding firms to conduct all mould testing and proving prior to actual production in separately equipped departments. Usually this entails the provision of one or more injection-moulding machines of a pattern, size and speed of operation comparable with those employed directly on production activities. It also involves the setting apart of one or a number of persons whose sole activities lie in connection with the proving and testing of new moulds preparatory to production.

Very numerous advantages are to be derived from this kind of moulding works organization:—

(a) Normal production routine in the moulding shop can proceed without the frequent interruptions and delays otherwise necessitated by repeated stoppages for testing a new mould construction.

(b) Promised deliveries of moulded articles from such a newly constructed mould can be more readily fulfilled.

(c) This procedure also allows the actual testing functions to be executed in an atmosphere removed from urgent day-to-day production, so promoting more thoroughgoing proving and more reliable moulding tools being passed to the production shop.

(d) By having a staff of individuals devoting full-time efforts to such duties, it follows that they will in a short time become highly skilled and experienced in detecting possible snags and in overcoming them. This, in its turn, will result in a reduction in the length of time required for testing and improved performance of the mould when put into service.

(e) By the same token, many useful time-saving fixtures, tools, jigs and toolroom appliances can be designed and made in order to facilitate mould checking, testing and handling, which otherwise in the rush production activities would have no chance of being evolved.

(f) Whilst the cost of installing such a proving department would be substantial, this would soon be offset by the reduced times and increased facility surrounding mould proving which would accrue.

(g) Very accurate costing of all mould-proving operations can be ensured when all such activities are performed by a special staff, or individual, in a separate department from the production shop, because the two operations can be kept distinct and free from overlapping. This latter tendency, almost invariably associated with other methods of mould proving, is the source of considerable difficulty in truly allocating charges to the appropriate works department, or in fact in correctly determining those expenses.

(To be continued)

The Microscopic Examination of Plastic Materials

VII.—Mouldings (Contd.)

By J. H. WREDDEN, F.R.M.S.
(Chief Chemist, Igranic Electric Co., Ltd.)

THE examination of the old moulding commenced last month showed that the material was, in some respects, different from that encountered at the present day. The greatest difference was seen in the bright colouring of the coloured portions of the material; these latter were so bright as to be almost equivalent to the type of colouring encountered in urea-formaldehyde materials, whereas the general trend of phenolic mouldings at the present time is towards dark colours, due, presumably to shortages of raw materials in one direction or another; it is nevertheless suggested that the possibility of producing more brightly coloured materials should not be overlooked.

However, in examining this material it was shown that the penetration of the resin—in the coloured portions—into the structure of the wood flour particles was very good indeed. This was due mainly to the fact that there was no pigment in these portions, the colour being achieved by the use of dyes.

It was also pointed out that, due to the absence of pigment, there was every probability of the impregnation of the filler particles being greatly facilitated, owing to the more fluid conditions of the resin as a result of this. The appearance produced by these well-filled particles was illustrated in colour, and it is now proposed to discuss the particle shown in Fig. 385B (see April issue), which is in monochrome at Fig. 386, at a magnification of 800 diameters. The particle here illustrated is seen in transverse section, the broad structural details are such that it is easily identifiable as softwood. The tracheids exhibiting the typical rectangular section. The chief reason for this lies in the almost perfect preservation of the structural details; thus the tracheids seen at A have clearly experienced little, if any, morphological distortion as indicated by the absence of any signs of collapse of the cell walls. The cell shown at B, however, has collapsed, this being due in all probability to location of the cell on the outside of the particle, on the one hand, and the rather thin external cell wall, on the other, for it is apparent that the collapse is experienced by this portion of the tracheid only; it will be noticed that the other three walls of the cell show no signs of collapsing, due presumably to their greater thickness.

It will also be noticed that the other cell C, situated in a similar position, shows signs of collapse on the outer wall,

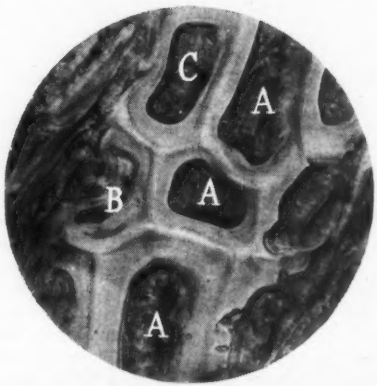
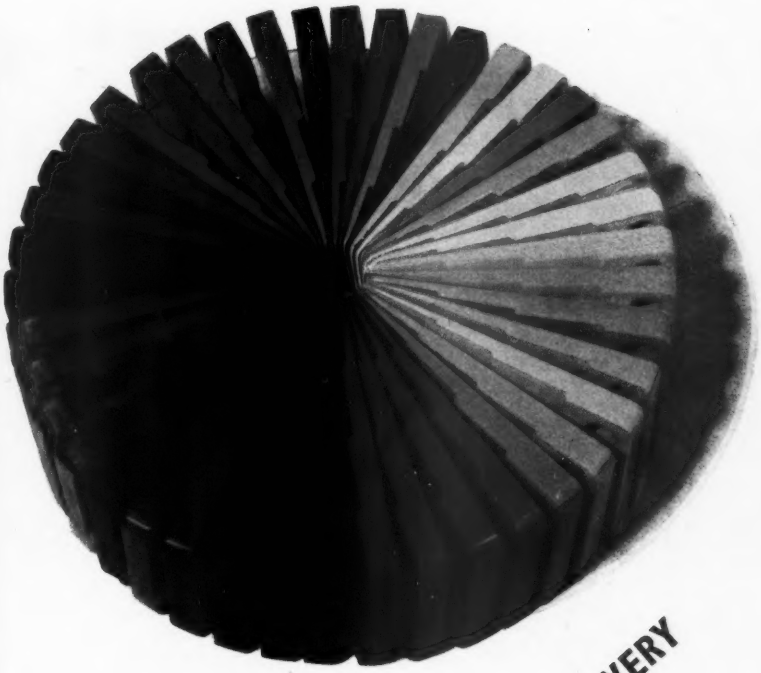


Fig. 386.—Section of old moulding (1922) showing penetration of resin. Mag. 800 diameters.



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but in this case the wall is somewhat thicker than seen in cell B, and has been able to withstand the forces tending to flatten the unit to a greater extent. In view of the unimpaired structure of the inner cells the reason for this tendency for the outer cells to collapse is not quite clear, as all the cells are equally well filled with resin. It is probable, therefore, that either the filling of the outer cells occurred somewhat later than that of the inner units, or, what is more likely, the filling of all the cells took place at much the same rate.

The collapse of the outer walls would thus have occurred before completion of the filling and would be resisted by the inner tracheids due to the greater thickness of the surrounding walls, for it will be seen that although the cells marked A are referred to as being the inner members, there are no complete cells supporting them on the right-hand side. The wall thickness, however, is considerable on this side of the particle and shows no obvious signs of succumbing to the difference of pressure which undoubtedly existed at one period during the process. There is, therefore, a certain degree of justification for regarding these cells as being protracted all round; the same argument, of course, applies to the externally presented wall of the upper and lower of these three particles.

Regarding the filling of these elements there is obviously no dubity, as this is clearly seen to be complete in all cases. It is interesting to note that in spite of the absence of pigment in the resin there does appear to be an indication of a structure in the masses to fill the tracheid and also in that surrounding the particle. This structure is largely due to the presence of an appreciable quantity of very fine wood dust, which we have previously seen, may be regarded as being an extraneous component present in wood flour. The presence of this is not exactly unexpected when the age of the moulding is taken into account. This being so, it is readily appreciated that this extraneous fraction will experience little, if any, filtering during the impregnation

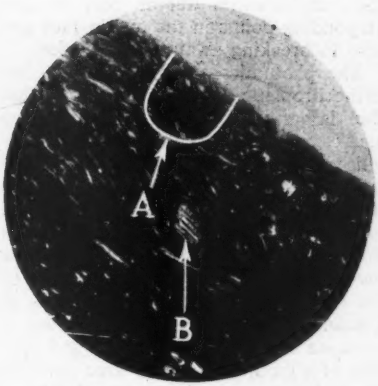

Fig. 387.—Old moulding: section through surface of red portion. Mag. 26 diameters.

of the structure under consideration, and in similar cases. Its presence does, however, point to the possibility that particles such as this are filled mainly during the moulding cycle and not on the rolls.

As a result of using a dye instead of pigmenting the resin, this red particle—an easy flowing material—is produced, as evidenced by the excellent impregnation of the wood flour just discussed. It is fortunate that one side of the red secondary particle is at the surface of the moulding, for it enables us to see and examine any effects occurring at this location. Thus in Fig. 387, we see the edge of the red portion at 26 diameters, photographed on an orthochromatic emulsion.

From this illustration, representing a general view of the structure at the mould face, it will be noticed that the finish produced at the surface is good, and although there is a collection of large wood flour particles at about the middle of the length of surface shown, they do not appear to be responsible for any undue disturbance of the structure, such as the production of resin pockets, etc., in spite of their lying actually at the interface. This is indicated by the apparent unevenness of the surface at these points, but does not mean to infer that the surface at this point is perfect; there are, in

fact, irregularities due in part to corresponding points in the mould face and also to breaking away of the section.

The photomicrograph was taken on orthochromatic emulsion in order that the larger filler particles which are unaffected by the dye may be distinguished against the background of small particles, dust and resin, which appear dark in tone. Thus those particles which are visible are seen to be the larger wood flour units. In consequence of this we are enabled to take a small portion of the surface and proceed to examine it in greater detail. The point selected is enclosed in the area marked A, and consists of a group of medium-sized particles situated at, or near, the surface with no indication of blocking having taken place.

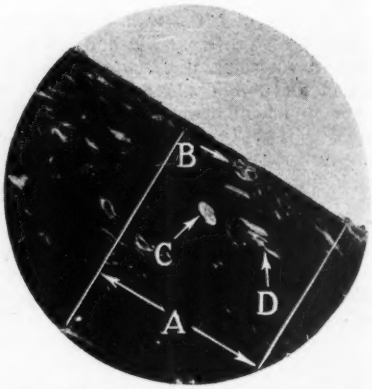

Fig. 388.—Old moulding: section through surface of red portion. Mag. 96 diameters.

Before proceeding with this, however, it will perhaps be as well to point out the existence of strong orientation shown by the long particles lying immediately to the left of the marked area. The movement and consequent flow at this point has quite evidently been considerable, as shown by the strength of the orientation, and it is interesting to note that the lesser mobility of the large particle B has caused a diversion so that the flow takes place to either side. The dark area above the particle indicates an almost clear mass of resin and as the particles in the moving mass are in contact with the lower face of the unit B, it is clear that the flow has occurred in an upward direction; in fact, the effect produced is very similar to what may be expected of a body of this shape situated in a fluid medium moving in the direction just mentioned.

Reverting to the examination of the marked portion of the edge. This is seen at a magnification of 96 diameters at Fig. 388, the area in question lying between the two lines indicated at A. The three particles, B. C. and D, will be easily identified with those seen in the previous illustration. It will be noticed also that particle B lies actually at the surface, with the other particles below or to the left of it. All the particles in the group are seen to be well separated with no signs of interference between them. Whereas the particles C and D would normally be expected to give rise to a tendency for blocking to occur, there is no evidence in the case under consideration; in fact, the separation of these particles would rather point to a very fluid condition of the mass which allowed an easy flow and stabilizing of the material, in so far as the siting of the filler particles is concerned, before final setting occurred. Further evidence of this is seen in the structure of the surface below the area in question in the presence of a number of well-separated elements of similar size. The orientation of those particles which are seen in longitudinal section is also worthy of note.

It was pointed out, while discussing the previous photograph, that an area of turbulence around one large particle existed in a mass exhibiting strong flow lines. This mass was located to the right of the edge under examination; in other words, some distance inwards from the surface of the moulding. The same degree of flow and turbulence is not evident at the surface, and therefore one might consider a zone or surface layer of appreciable depth where extra fluidity occurs prior to setting and in a shorter time to that occurring at the more deeply seated parts of the moulding.

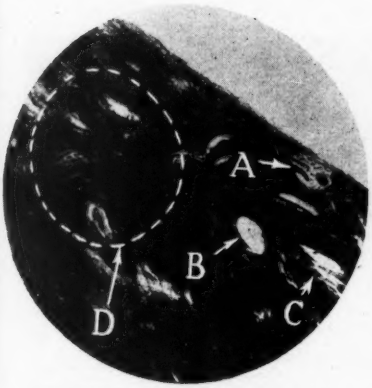

Fig. 389.—Old moulding: section through surface of red portion. Mag. 200 diameters.

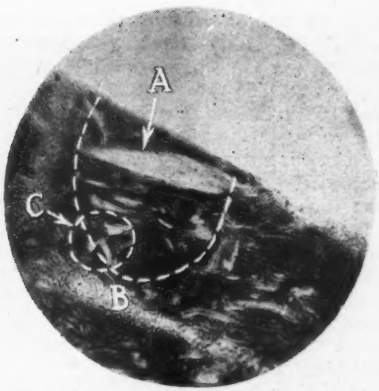

Fig. 390.—Old moulding: section through surface of red portion, showing large wood particle. Mag. 96 diameters.

This would be due chiefly to the rapid heating taking place at the mould surface, bringing about a sudden and large drop in viscosity, which would enable conditions to stabilize before setting occurred. In the meantime, the heating of the internal areas would be slower; in consequence of which it is quite possible, and indeed probable, that the viscosity of the mass never would be as low as that of the surface zone at its lowest, before immobility occurred. Hence complete stability cannot be achieved; otherwise the flow patterns would not be fixed in the manner seen, for it will be appreciated that masses such as these become set before movement has ceased.

Although a surface zone is capable of definition, it is impossible to draw a hard-and-fast line distinguishing the rapidly heated material from that which is less rapidly heated and exhibits marked internal flow or turbulence patterns. Even at the surface this phenomenon is seen to be present, although on a much smaller scale and only capable of being detected at relatively high magnifications. Thus in Fig. 389 we see a portion of the same illustration at a magnification of 200 diameters. The same three particles appear at A, B and C, from which it is clear that on a very small scale the absence of blocking is due chiefly to the presence of fine dust and single tracheids in the matrix material. Instead there are distinct signs of channel formations; for example, between particle C and the surface, and also between the A and B units.

An area of turbulence giving rise to a curious star-like orientation of the small filler particles is discernible within area D. This configuration is not commonly met with in this type of material, and the cause of its occurrence is not clear; but from the manner in which the fine wood particles are orientated, it would appear likely that a point of low pressure existed at the centre of the star, probably as a bubble of air, causing a momentary inward flow from all directions as the pressure rose. Final stabilizing of conditions being prevented due to setting, throughout the discussion of these effects in the surface zone one should not overlook the fact that the phenomena are occurring on a very small scale. The depth of the fast cured zone is probably no more than .012 mm., while the turbulence shown within the area D occurs within a diameter of about .01 mm., which serves to emphasize the small scale, on the one hand, and the highly fluid nature of the material during moulding on the other.

In the case of larger particles sited at or near the surface of this portion of the section, there appears to be little or no disturbance due to blocking, although in certain circumstances there may be a tendency to modify or delay the stabilization of the structure, so that this cannot occur before the resin has set. Fig. 390 shows a fairly large wood particle at a magnification of 96 diameters. This unit is seen to be situated close to the surface of the red particle under consideration and is marked A. The particle itself is seen to be in longitudinal section and lying with its long axis somewhat obliquely to the surface.

In the area immediately above this particle at B are a number of smaller wood flour elements, also in longitudinal section, whose orientation clearly indicates some considerable flow in a direction from left to right over particle A; in fact, the structure at this point would tend to suggest that originally particle A was situated more or less at right-angles to the surface of the moulding. During the process when liquefaction occurred, movement took place in the direction mentioned, probably due to unbalanced pressures arising from a cause situated further along to the right. This would tend to push the particle over until it assumed the position seen in the illustration.

All this has apparently occurred in only a thin zone, which, as we have already seen, becomes fluid more rapidly than the deeper-situated material. Assuming this condition to exist in the current case, it is clear that the flow would be bounded on the inside by the surface of this stiffer material, which would result in the formation of a channel, also even in the surface zone itself the viscosity of the material would vary throughout the depth until stabilization occurred. This would, of course, take place in a very short time owing to the thinness of the highly fluid layer.

As a result of this assumption it will be appreciated that during the short time the movement is occurring in the channel,

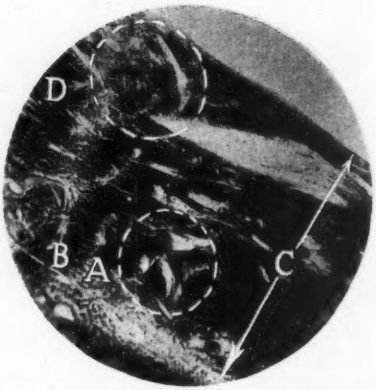

Fig. 391.—Old moulding : section through surface of red portion showing large wood particle. Mag. 200 diameters.

there will come into being secondary effects on the inner and outer surfaces of the channel, until the viscosity has risen sufficiently to stop movement. These secondary effects would take the familiar forms already pointed out during the examination of previous mouldings, such as vortices, etc. A certain amount of evidence exists in the structure around the large wood particle currently under examination; thus if we examine at the somewhat higher magnification of 200 diameters, as seen in Fig. 391, it is seen that the group of small particles (A) above the large one show a distinct tendency to vortex formation.

By their position they constitute a valuable guide as to the depth of the surface zone, particularly when the position of the further vortex B is taken into account. This lies in line with and to the left of the group A, and is evidently derived from the very small filler elements to be found in this moulding. It is, therefore, somewhat more clearly defined than the vortex formation in the group A; however, its chief value lies in its position relative to A, thereby fixing the approximate depth of the surface zone as lying between the surface and the dotted line indicated by the arrow C.

If now the surface side of the zone is

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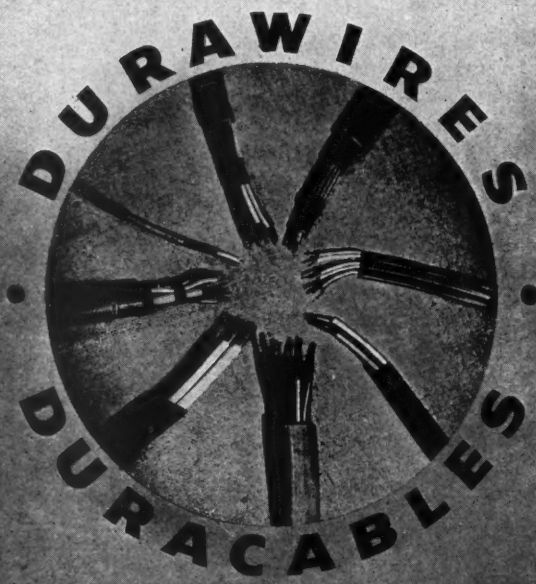

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examined, there is seen to be little, if any, evidence of the occurrence of well-marked vortices such as those just discussed. Exceptions would occur in the expected places, such as under the distal end of the large particle shown at D, where a vortex may be expected to occur as the main streams of movement sweep past the tip of the falling particle: in such an event, and bearing in mind the rapidity with which everything happens, it is possible that quite a violent vortex would be developed which was sufficiently pronounced to exist for a time long enough for it to be fixed in the manner shown.

Elsewhere at the surface, there seems to be a condition of stability showing no pronounced fixing of flow and turbulence patterns. This may well be due to the lack of disturbing influences, except for cases such as the large particle, for it will be appreciated that, whereas the mould surface forming the outer boundary of the channel is highly polished, the inner boundary is only developed as a secondary effect produced mainly by the transference of heat from the outer surface. The apparent surface of this inner boundary will clearly be dependent upon the thermal conductivity of the material at the surface. This, of course, must vary to a considerable degree from point to point, depending on the concentration and size of the filler particles present, so that it will be seen that the surface of the inner boundary must be very irregular when compared to that at the mould face, and therefore the degree of disturbance at the internal face may be expected to be greater.

Apart from this, the material at the surface could be expected to reach immobility with great rapidity, so much so that turbulence effects hardly have time to become operative, except in pronounced cases. On the other hand, there would be more time initially for the patterns to develop at the inner boundary, as more time would be available before setting if the resin fixed them. In general, it would appear that some such

Fig. 392.—Old moulding: section showing pigmentation in black portion. Mag. 96 diameters.

mechanism would explain the absence of large flow patterns in the surface zone, such as may be encountered in the deeper-seated portions of the moulding.

The red material just discussed had no pigment incorporated and therefore the signs of somewhat greater fluidity during the liquid phase of the moulding cycle were rather to be expected than otherwise. In the case of the black matrix material, one would not expect such characteristics to be so markedly in evidence; however, it is necessary to examine it in order that all available information may be obtained. Thus, we see that even at fairly low magnifications of the order of 100 diameters, the material shows unmistakable signs of high-quality structure. In Fig. 392 is illustrated a portion of the black matrix containing a large wood flour particle (A) and several smaller ones.

The significant feature of this photograph is the unmistakable evidence of the excellent impregnation of the large wood particle This unit appears at this magnification to be as well impregnated as the large particle discussed during the examination of the red portion of the moulding. At the same time, the other smaller particles, two of which are situated to either side of that marked A,

Fig. 393.—Old moulding: section of black portion showing large wood particle. Mag. 200 diameters.

and one underneath B, C, and D, are also seen to be completely filled, as nearly as can be ascertained at this magnification. In fact, the smaller particles, particularly, show very little signs of having suffered.

The central particle, however, in spite of being filled, exhibits unmistakable signs of collapse, particularly in those cases where the cell walls are thin. This is more or less to be expected, and whereas the particle examined in the red mass showed little or no collapse in the current case, it must be borne in mind that the resin is pigmented and therefore the degree of fluidity attained in the liquid phase of the moulding cycle cannot be expected to be so high. Thus the impregnation of the structure will take longer, which, in turn, will allow a difference of pressure to exist for a longer period of time.

This general view of the structure of the black material also shows that even the smaller and less clearly visible particles indicate their being filled; in particular, attention is drawn to a particle seen in longitudinal section immediately above particle A. The filling of all these structures, however, is only indicated by a dark tone in this photograph, magnification not being high enough to show the presence of individual pigment granules. In view of this it is proposed to examine the structure of the large particle at succeedingly higher magnifications, chiefly with a view to obtaining information regarding the behaviour of the pigment, for indications so far point to this latter being very fine and evenly distributed in contradistinction to the conditions found in the more modern two-part material recently discussed ("Plastics," February and March, 1949).

In Fig. 393 we see the same particle at a magnification of 200 diameters. The most obvious feature to stand out is the fact that the contents of the various cells in the particle are not all of the same density; thus the filling of the large central cell A is seen to vary in density in itself. The cell has obviously been flattened to a considerable extent during processing, and therefore the cross section area of the lumen is very irregular in shape and it is probable that in instances such as this, some difficulty would be experienced by the moving mass of resin.

It will be noticed also that there are two smaller cells situated at the ends of the central cell, which have collapsed to a considerable extent, so much so that the unit on the left is almost obliterated. However, sufficient of the lumen remains to show the low tonal density of the contents. This latter is seen to be very dense in a case where little or no restriction has occurred, as evidenced by the density of the filling of individual thick-walled elements below the large particle; in this we have an example of the perfect filling which is capable of being attained when there is no restriction due to collapse of the lumen. The magnification in this instance is sufficient to show definite signs of pigment granules of very small size in the less dense portions; however, it is unwise to make a definite assertion as to this being the case, until closer examination confirms the assumption.

(*To be continued*)

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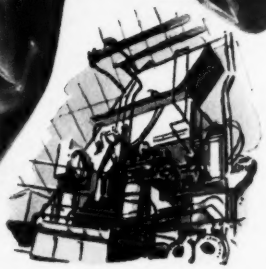

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PATENT REVIEW

The following abstracts have been made from specifications at the Patent Office, with the permission of the Controller of H.M. Stationery Office. Complete specifications can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2. price 1/- each.

B.P. 611,828. Appl. 9.5.46. Acc. 4.11.48.
Treatment with Resinous Polymers of Fibrous Materials. P. Alexander. To: Wolsey, Ltd.

A process for treating fibrous materials consisting wholly or partly of wool to improve the handle, abrasive resistance and resistance to felting and shrinkage wherein the fibrous material is first impregnated with a cationic emulsifying agent then impregnated with an emulsion of a resinous vinyl polymer (polymethyl methacrylate plasticized with diethyl phthalate) containing an anionic emulsifying agent and dried.

B.P. 611,829. Appl. 9.5.46. Acc. 4.11.48.
Treatment of Textile Fibrous Materials with Vinyl Compounds. P. Alexander. To: Wolsey, Ltd.

A process for treating textile fibrous materials to improve the handle, abrasive resistance and resistance to felting and shrinkage wherein the fibrous material is first treated with a cationic emulsifying agent, then immersed in a bath of an emulsion of a vinyl monomer, containing an anionic emulsifying agent and the monomer on the fibrous material is polymerized while still in the bath.

B.P. 611,830. Appl. 9.5.46. Acc. 4.11.48.
Emulsion Polymerization of Vinyl Compounds. P. Alexander. To: Wolsey, Ltd.

A process for the emulsion polymerization of vinyl compounds (vinyl chloride, styrene, vinylidene chloride) wherein a vinyl compound is emulsified by exposure to mechanical vibrations of a frequency of at least 5 kc./sec. in an aqueous liquid in the presence of a polymerization catalyst.

B.P. 611,915. Appl. 5.10.45. Conv. (Belgium) 21.1.43. Acc. 5.11.48.
Synthesis of Vinyl Chloride. To: Solvay and Co.

Process of producing vinyl chloride by reacting acetylene and hydrogen chloride in the presence of a catalyst containing mercuric chloride and a promoter consisting of hydrated alumina.

B.P. 611,919. Appl. 30.11.45. Conv. (Netherlands) 23.12.41. Acc. 5.11.48.
Manufacture of valuable Reaction Products of High Molecular Unsaturated Substances containing more than one Unsaturated Grouping in the molecule with Inorganic Acids or Acid Anhydrides. To: N.V. de Bataafsche Petroleum Maatschappij.

B.P. 611,920. Appl. 12.12.45. Conv. (Netherlands) 3.12.42. Acc. 5.11.48
Removal of Impurities of an Inorganic Nature from Aqueous Liquids by means of Resin Gels. To: D. J. Meijers Dextrinefabrieken N.V.

A process for the removal of impurities of an inorganic nature from aqueous liquids by means of synthetic resin gels of the kind used in ion-exchange processes which are regenerated with electrolyte solution after use, wherein the impurities accumulated in the synthetic resin gels are dissolved in aqueous electrolyte solutions when rinsing, preferably in alkaline solutions and are wholly or partly removed from the resin gels by rinsing with water, preferably hot water.

B.P. 611,944. Appl. 13.5.46. Acc. 5.11.48.
Apparatus for R.F. Heating. D. Jackson. To: Pye, Ltd.

Further development of "spot welding gun." Stray field heating for spot welding. The outer cylindrical electrode is rotatable around the inner electrode and the latter carries a tuning coil so that tuning to the load can be effected by rotations. Contact to inner electrode made by brush. Used either as hand tool or incorporated in foot-operated welding machine.

B.P. 612,019. Appl. 19.3.46. Conv. (U.S.A.) 19.3.45. Acc. 8.11.48.
Thermosetting Cements for Optical Systems. W. F. Parsons and J. R. Dann. To: Kodak, Ltd.

(1) Thermosetting lens-cement comprising the partial polymerization product of a mixture of a vinyl carboxylic acid ester, an acrylic acid ester, an alpha methacrylic acid ester, or a vinylbenzene; (2) a divinylbenzene acrylic anhydride or an alpha-alkacrylic anhydride; (3) a diallyl compound or di-2-alkallyl compound containing a chain of from 11 to 14 atoms between the two allyl or two alkallyl groups.

B.P. 612,023. Appl. 15.5.46. Conv. (U.S.A.) 28.6.44. Acc. 8.11.48.
Making Cellular Thermoplastic Sheet

Material and receptacles therefrom. To: United States Rubber Co.

A method of forming a cellular thermoplastic sheet material which comprises the steps of forming a composition comprising rubber, hard thermoplastic resin, a vulcanizing agent and chemical blowing agent, sheeting the mixed composition, plying a plurality of said sheets together and pressing said sheets together under heat to form a cellular sheet.

B.P. 612,070. Appl. 17.5.46. Acc. 8.11.48
Producing Translucent and Opaque Polymeric Material. T. Downing and W. E. F. Gates. To: Imperial Chemical Industries, Ltd.

Relates to the copolymerization of styrene and methyl methacrylate, the resulting polymer having improved optical properties.

B.P. 612.108. Appl. 6.2.45. Conv. (U.S.A.) 17.4.44. Acc. 9.11.48.
Pressure Sensitive Adhesive Sheets or Tapes. To: Minnesota Mining and Manufacturing Co.

A pressure sensitive adhesive sheet or tape, having an eucohesive adhesive coating consisting mainly of pasty or liquid tacky rubber thermally combined with sufficient oil-soluble phenol-aldehyde resin so as to be more cohesive than adhesive but still tacky.

B.P. 612,121. Appl. 5.2.46. Acc. 9.11.48
Moulding Materials and Methods of producing same. A. Amigo and B. Deutsch.

A process for the production of moulding materials which comprises first preparing a viscous solution of a thermoplastic synthetic resin or mixture of thermoplastic synthetic resins (polyvinyl resins) in an organic solvent, thereafter incorporating water or an aqueous liquid with said viscous synthetic resin solution until an emulsion is obtained in which the resin solution constitutes the continuous phase, and the water or aqueous liquid the disperse phase, thoroughly incorporating a filler in discrete form with said emulsion until a dough-like mass is formed, allowing the volatile constituents of the synthetic resin solvent and the aqueous liquid to evaporate, so as to bring about a gradual deposition of the synthetic resin on the particles of filler and subsequently ageing the mixture in order to permit further precipitation of the synthetic resin on the particles of filler.

B.P. 612,128. Appl. 5.4.46. Acc. 9.11.48
Production of Board-like Materials. S. A. Ede. To: James Ferguson and Sons, Ltd.

Production of board-like materials employing fibrous materials stiffened with thermosetting synthetic resins.

B.P. 612,166. Appl. 14.5.46. Acc. 9.11.48.
New Synthetic Resins. E. M. Evans and H. F. Hookway. To: British Resin Products, Ltd.

Condensation product prepared by reacting formaldehyde with compounds containing the grouping $CH\text{-}SO_2\text{-}CH$.

B.P. 612,302. Appl. 23.5.46. Acc. 10.11.48.
An Improved Electrical Insulating Compound. D. C. Hancock and D. T. Hollingsworth. To: British Insulated Callender's Cables, Ltd.

Insulating compound which can be poured when hot and becomes viscous on cooling, comprising mineral oil, polythene, and a rubbery hydrocarbon soluble in the mineral oil.

B.P. 612,311/2. Appl. 17.4.45. Acc. 11.11.48.
Production of Polymerizable Esters. F. Armitage, J. A. Cottrell and D. H. Hewitt. To: Lewis Berger and Sons, Ltd.

B.P. 612,331. Appl. 14.3.46. Conv. (Netherlands) 2.5.45. Acc. 11.11.48.
Process for Polymerizing Polymerizable Substances in the form of an Emulsion. To: N. V. De Bataafsche Petroleum Maatschappij.

Continuous low-temperature polymerization of vinyl chloride.

B.P. 612,372. Appl. 22.5.46. Acc. 11.11.48.
Treatment of Tanned Leather with Amino Resins. A. T. Hough. To: British Leather Manufacturers Research Association.

B.P. 612,416. Appl. 29.3.45. Acc. 12.11.48.
Synthetic Resin Compositions. E. S. Narracott and K. J. Rowland. To: Anglo-Iranian Oil Co., Ltd.

This invention relates to the production of phenol-aldehyde resin compositions, containing hydrocarbon materials derived from mineral oils by processes of solvent extraction, and, in particular, to the production of resins of a thermosetting type which may be remoulded after being exposed to conditions of curing.

B.P. 612,477. Appl. 24.5.46. Acc. 12.11.48.
Manufacture of Moulded Articles and more particularly articles such as Artificial Teeth. To: H. D. Justis Son, Inc.

B.P. 612,504. Appl. 16.7.43. Acc. 15.11.48.
Manufacture of Sheets and Coatings of Plastics. E. V. Giles.

Refers to the use of infra-red drying in the manufacture of plastic films or sheets.

B.P. 612,505. Appl. 17.8.43. Acc. 15.11.48.
Manufacture of Compound Sheets comprising Fabric and Plastic Material. E. V. Giles.

Refers to resorcinol-formaldehyde Condensation products.

B.P. 612,506. Appl. 24.11.43; 12.1.44. Acc. 15.11.48.
Reinforced Plastic Materials. H. Kremer.

B.P. 615,525. Appl. 12.2.46. Conv. (U.S.A.) 8.2.45. Acc. 15.11.48.
Condensation Products and Process of producing same. To: The Borden Co.

B.P. 612,589/90. Appl. 29.5.46. Conv. (U.S.A.) 30.5.45. Acc. 15.11.48.
Production of Vinyl Cyanide. To: E. I. Du Pont de Nemours and Co.

B.P. 612,605. Appl. 3.6.42. Acc. 16.11.48.
Cooling Compositions containing Thermoplastic Resins. F. R. Stoner, Jr., and D. M. Cabe-Gray.

Coating of metal surfaces with a solution comprising a vinyl chloride, vinyl acetate copolymer, and a solvent. The solvent is subsequently evaporated and the coating baked.

B.P. 612,609. Appl. 10.5.45. Acc. 16.11.48.
Production of Polymeric Materials. R. W. Moncrieff. To: British Celanese, Ltd.

Production of nitrogen containing polymers by heating a di-hydroxide of a dicarboxylic acid in presence of hydrazine until a polymer is produced.

B.P. 612,646. Appl. 28.5.46. Acc. 16.11.48.
Silicone Intermediates. W. K. Buchanan and W. Simpson. To: Metropolitan-Vickers Electrical Co., Ltd.

B.P. 612,647. Appl. 28.5.46. Conv. (U.S.A.) 29.5.45. Acc. 16.11.48
H.F. Dielectric Heating Apparatus. British Thomson-Houston Co., Ltd.

R.F. drying of materials on conveyor belt, using staggered rod electrodes above and below conveyor. 5-25 mc/s.

B.P. 612,697. Appl. 30.5.46. Conv. (France) 26.6.45. Acc. 16.11.48.
Polyvinyl Resin Compositions. To: Société des Usines Chimiques Rhône Poulenc.

Process for reducing the tendency of polyvinyl resins or compositions to deform and soften under the action of heat by incorporating in the resin an alcoholate of aluminium.

B.P. 612,982. Appl. 12.6.46. Acc. 19.11.48.
Embossing Fabrics coated with Polyvinyl Compositions. R. G. Humphries. To: Greenwich Leathercloth Co., Ltd.

B.P. 612,992. Appl. 13.6.46. Conv. (U.S.A.) 23.6.45; 25.1.46. Acc. 19.11.48.
Preparation of Fluoro-Chloro Compounds. To: Kinetic Chemicals, Inc.

B.P. 613,018. Appl. 3.5.45. Acc. 22.11.48.
Improved Polythene Compositions. W. E. F. Gates.

B.P. 613,020. Appl. 10.5.45. Acc. 22.11.48.
Polymeric Materials and Processes for their Production. J. W. Fisher, E. W. Wheatley and H. Bates. To: British Celanese, Ltd.

B.P. 613,106. Appl. 9.5.44. Acc. 23.11.48.
Polyhydric Phenol - Aldehyde Resin Adhesives. To: Pennsylvania Coal Products Co.

Cold-setting resin adhesive comprising a permanently fusible resorcin-formaldehyde resin of given pH in a 50 per cent. aqueous solution (2.5-6) dissolved in a neutral solvent and a formaldehyde liberating setting agent.

B.P. 613,180. Appl. 14.6.46. Conv. (U.S.A.) 13.6.45. Acc. 23.11.48.
Thermosetting Compositions. To: E. I. Du Pont de Nemours and Co.

Thermosetting composition prepared by blending an ethylene-carbon monoxide copolymer, previously heated with an alkaline compound to increase its unsaturation with a formaldehyde compound sufficient to provide up to 50 per cent. free formaldehyde (based on the weight of the modified copolymer).

B.P. 613,219. Appl. 6.6.46. Conv. (U.S.A.) 11.6.45. Acc. 24.11.48.
Hydrogeneration of Dimeric Alpha Methyl Para-Methyl Styrene. A. J. Warner and S. R. Hartstein. To: Standard Telephones and Cables, Ltd.

B.P. 613,354. Appl. 21.6.46. Acc. 25.11.48.
H.F. Heating Equipment. C. E. Eadon-Clarke. To: Standard Telephones and Cables, Ltd.

Conventional design of R.F. heater with heating chamber incorporated. The heating chamber is separated from the generator by

a transparent or translucent screen (polystyrene) so that the anode glow of the oscillator valve can be observed, to ensure that operating conditions are safe for the valves.

B.P. 613,358. Appl. 21.6.46. Conv. (France) 22.6.45. Acc. 25.11.48.
Production of Articles from Multi-coloured Plastic Materials by Extrusion. J. Delorme.

B.P. 613,368. Appl. 24.6.46. Acc. 25.11.48.
H.F. Heating Equipment. K. M. Burk. To: Standard Telephones and Cables, Ltd.

See B.P. 613,354. Novel feature: Air cooling system is used for valve cooling and removal of moisture from heating chamber.

B.P. 613,419. Appl. 19.3.45. Acc. 29.11.48.
Apparatus and Method for Heating Work by the use of H.F. Electric Energy. E. G. Autie and M. R. Monk. To: Arc Manufacturing Co., Ltd.

Pulsing system for H.F. roller welders. H.F. energy is applied to the rollers in pulses, frequency and duration of which depends on roller speed. This is supposed to ensure that power input into the material is controlled by roller speed.

B.P. 613,497. Appl. 10.5.45. (Divided out of B.P. 613,020.) Acc. 29.11.48.
Polymeric Materials and Processes for their production. J. W. Fisher, E. W. Wheatley and H. Bates. To: British Celanese, Ltd.

Process for further treatment of poly-1.2.4. triazole comprising treatment of the polymer with an acylating agent or an aldehyde or ketone.

B.P. 613,506. Appl. 26.4.44. Conv. (U.S.A.) 28.5.42. Acc. 30.11.48.
Shaping of Sheets of Polymerized Unsaturated Esters of Polybasic Acids. To: Pittsburgh Plate Glass Co.

Method of preparation of shaped sheets made from diallyl phthalate, comprising heating of such a sheet containing at least 85 per cent. of acetone in soluble polymer to a temperature exceeding 50 degrees C., shaping the sheet whilst maintaining the temperature and cooling before removing the shaping forces.

B.P. 613,509. Appl. 17.11.44. Conv. (U.S.A.) 14.7.41. Acc. 30.11.48.
Olefin Polymerization. To: Phillips Petroleum Co.

Refers to the polymerization of tertiary base olefins to form lubricating oils.

B.P. 613,576. Appl. 18.6.46. Acc. 30.11.48.
Process for Gluing Wood. C. E. Smith. To: British Resin Products, Ltd.

A process for gluing or bonding wood surfaces together, which comprises first applying an aldehyde to one or both of the surfaces to be bonded together, and thereafter applying to one or both of the surfaces a synthetic resin adhesive composition, bringing the two wooden surfaces together and subjecting the assembly to a suitable curing treatment. The aldehyde in question is furfur-aldehyde.

B.P. 613,635: Appl. 21.6.46. Conv. (France) 23.6.45. Acc. 1.12.48.
Production of Articles from Multi-coloured Plastic Materials by Extrusion. J. Delorme.

Apparatus for extruding multi-coloured shaped articles wherein each of the different coloured plastic materials enters its distributing groove through a feed passage, which is located in a different plane from the said groove.

B.P. 613,648. Appl. 24.6.46. Acc. 1.12.48.
Aryl Substituted Silicanes and their conversion by Hydrolysis into the corresponding Silicols.

B.P. 613,689. Appl. 26.6.46. Acc. 1.12.48.
Containers for Hydrogen Peroxide. W. S. Wood and J. Harnaman. To: B. Laporte, Ltd.

Container for highly concentrated hydrogen peroxide consisting of stoneware, glass, polythene, polystyrene or polyvinyl chloride.

B.P. 613,701. Appl. 27.6.46. Conv. (U.S.A.) 24.8.45. Acc. 1.12.48.
Bonding Rubber-like Materials to Metal. To: United States Rubber Co.

A method of bonding a composition of natural or synthetic rubber to the surfaces of metal base, which comprises applying over said metal base a layer comprising an uncured mixture of natural or synthetic rubber with silica aerogel particles and subsequently uniting the assembly by means of heat and pressure.

B.P. 613,820. Appl. 15.6.45. Acc. 3.12.48.
Orienting Crystalline Resinous Bodies. To: Firestone Tyre and Rubber Co.

Relates to the production of oriented crystalline resinous filaments, rods, sheets, tubing, etc., from crystalline vinylidene. chlorine resins.

Leaves from a Moulder's Notebook

This is the twenty-eighth in a series of notes by B.I.P Development Department on the problems of the moulder and designer. Nos. 1-12 in this series are already available in booklet form and a second volume which will include this article is being prepared. Comments and enquiries are welcome.

Dwelling

Probably the most important phase of the moulding cycle is holding the closed mould under low pressure for a short time to allow heat from

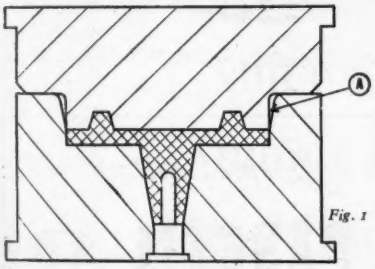

Fig. 1

the mould to be absorbed by the moulding powder before the application of high pressure. This applies where 'breathing' is customary as in the case of Beetle being used in a complicated mould.

With a mould such as that shown in Fig. 1, this procedure, commonly known as 'dwelling,' helps to make the material flow into the webs or bosses in the punch and die before it attempts to squeeze between the mould faces at "A."

A controlled dwell, particularly if it can be followed by a controlled slow

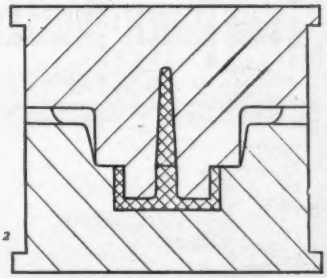

Fig. 2

application of high pressure, facilitates moulding the type of article shown in the mould in Fig. 2.

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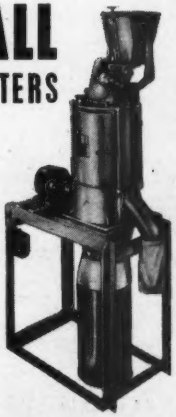

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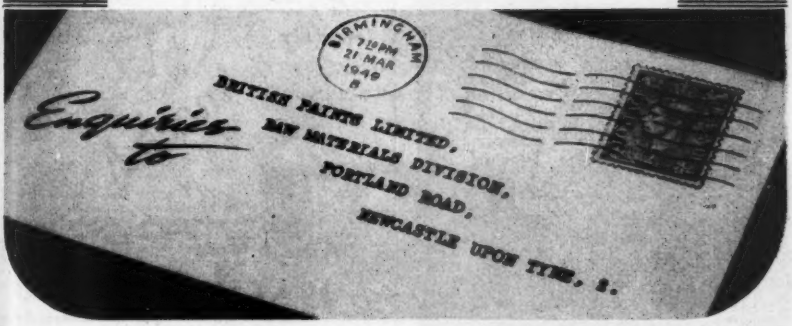

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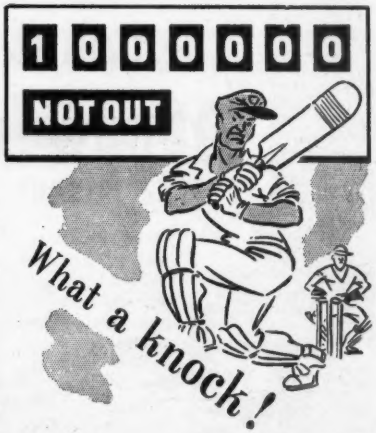

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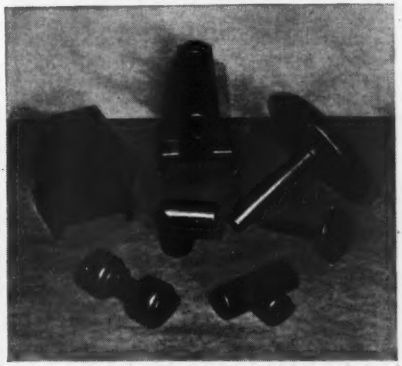

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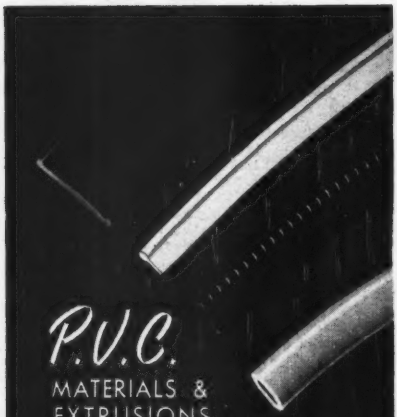

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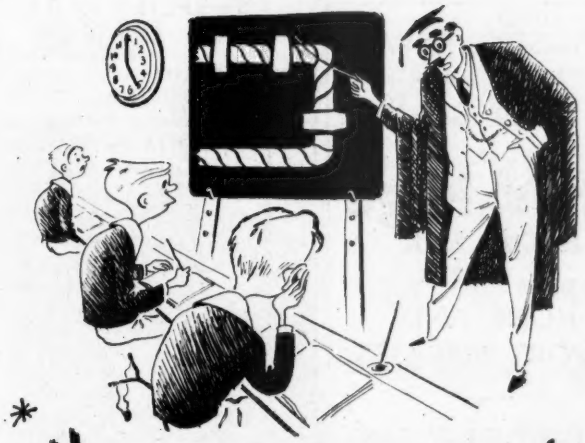

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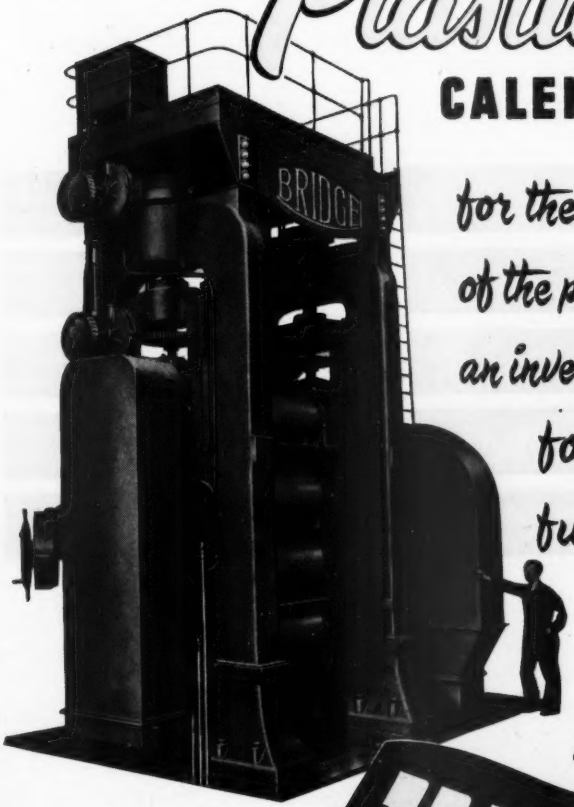

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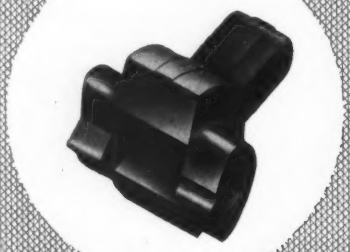

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50-ton Turner plastic press for sale in new condition, only had a few hours' use, will accept £500. Makers' price is about £750. S. G. Young, 154 Blackfriars Road, London, S.E.1. 145-x5254

Iddons extrusion press, motorised A.C. 415/3/50.
Rosedown hydraulic pump, model B.11, 3-throw, 2-stage, 2 tons sq. inch, with 15 h.p. motor 415/3/50 and Igranic starter.
Shaw hydraulic accumulator, 100 tons cast iron weight, loaded type, with three throw pumps, motor A.C. 415/3/50, latest design as new. Two Shaw hydraulic presses, 60 tons, four columns, platens 3 ft. 6 ins. by 4 ft., daylight 6 ft. 6 ins., as new.
Ingersoll Rand horizontal compressor, 100 cubic ft. per minute, motor A.C. 415/3/50.
W. Urquhart, 1023-1027 Garratt Lane, S.W.17. 147-978

Vertical injection machine, 1½oz. capacity, complete with air compressor, air bottle and motor, in perfect condition; can be viewed N.W. London. Price complete unit, £280 or nearest offer. Box P448, care of "Plastics." 144-19

Full steam in five minutes with B. and A. Electrode Boilers, used by British industries for 20 years. No boiler-house, no flue, no attendant needed. The most compact and convenient steam raisers available. Can go beside machines using the steam. Write for leaflet 118, Bastian and Allen, Ltd., 11 Bedford Square, W.C.1. 146-979

— MACHINERY, TOOLS AND PLANT WANTED —

Small P.V.C. extrusion machine, electrically heated for laboratory purposes required. Vinyl Products, Ltd., Carshalton, Surrey. 144-16

Tools wanted of Baby's rattle moulding. Purchase considered after inspection of tools and satisfactory sample. Box L.934, Willings, 362 Grays Inn Road, London, W.C.1. 144-15

Die-sinking machine (G.K.2, Alexander or similar). No. 1 size not required. H.B. Sale, Ltd., Birmingham. 144-5

Wanted, injection moulding machines, medium or large sizes. Box P4336, care of "Plastics." 144-22

Required, One injection moulding machine, size 3 ozs., preferably model H.E.9. Full details and prices to Box P4412, care of "Plastics." 144-26

PRODUCTION CAPACITY AVAILABLE AND WANTED

Dohm, Ltd., pulverize raw materials everywhere. 167 Victoria Street, London, S.W.1. zzz-224

Injection moulding specialists have moulding capacity up to 4 oz. Consultants on all injection moulding problems. Please send inquiries to Box 5328, care of "Plastics." zzz-236

Injection moulding capacity available on 3-oz. injection moulding machine for short and long runs. Box 5327, care of "Plastics." zzz-235

Repetition in Ebonite, Erinoid, etc. Capstan lathe work. Mansell, Temple Street, Rugby. 149-543

Injection mouldings in therm-plastics. Mouldings in styrene, acrylics and acetate. Design and toolroom facilities available for mould construction. Inquiries invited. J. and E. Courtnay, Ltd., 138 Stratford Road, Birmingham, 11. 144-823

Printing, engraving, etc., on all types of plastics. Modern Plastics, Ltd., Kangley Bridge Road, S.E.26. 148-929

Fairman Precision Tools and Products, Ltd., of Horley, Surrey, have capacity for the manufacture of bakelite and plastic moulds, diecasting dies, press tools and special purpose machines. Also all classes production machining. Phone, Horley 909. 148-936

Old-established firm wishes to employ surplus light engineering capacity and/or to give further scope for its sales force calling on builders' merchants. Will carefully consider and proposition representing a turnover of £10,000 to £200,000 p.a. The article(s) must be of good quality, preferably novel but proved and might be branded with advertiser's name which is very well known in other fields. Advertisers are not in the plastic moulding business but can produce such moulds as might be required. Box P443, care of "Plastics." 144-12

Swedish manufacturer of rubber-like plastic material wants to contact machine factory supplying take-up and inspection table together with cutting machine for sheets, width 1 m, thickness 3, 4 or 5 mm. Replies to "Swedish firm," Box P445 care of "Plastics." 144-8

Production Capacity Available and Wanted (contd.)

P.V.C. silk screen printing. Table cloths, curtains, nursery patterns, etc. Capacity available for quantity runs. Quality work. Daily deliveries. Guaranteed adhesion and fastness of colour. Davis (Patents), Ltd., 18 Phipp Street, London, E.C.3. Bishopsgate 2939, 5091. 146-980

Injection moulding by I.O.G. Industries, Ltd., 41 Marshgate Lane, Stratford, E.15. Maryland 2804. 148-0927

" Impossible " moulding propositions invited by pioneer injection moulders with unusually qualified staff and most modern capacity up to 12 oz. Inquiries in strict confidence and without obligation. Box P4337, care of " Plastics." 144-23

—RAW MATERIAL AVAILABLE AND WANTED—

Cork ! Cork ! British Cork Mills, Ltd., 167 Victoria Street, London, S.W.1. Vic 1414-6. zzz-238

Buna-plast, a blending of synthetic rubber and P.V.C. specially processed for manufacturing leather substitute; this material is far superior to plasticized P.V.C. Inquiries welcomed. Dohm, Ltd., 167 Victoria Street, London, S.W.1. zzz-230

P.V.C. calendering compound in a range of opaque colours. Dohm, Ltd., 167 Victoria Street, London, S.W.1. zzz-229

Polystyrene moulding scrap urgently required, state amount available and send small sample. Box 3185, care of " Plastics." zzz-228

Polythene moulding powder (reconstituted) in black natural and a variety of colours. Dohm, Ltd., 167 Victoria Street, London, S.W.1. zzz-226

Metal powders and oxides. Quotations and samples on application. Dohm, Ltd., 167 Victoria Street, London, S.W.1. zzz-225

Ebonite and bakelite always in stock. Phone, Archway 3654. A. E. Goodeye, Ltd., 188a Seven Sisters Road, London, N.7. 151-634

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Phone, Victoria 9182-3. 144-592

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Virgin cellulose acetate moulding powder in transparent, transluscent and opaque colours, three-flow grades, now available from stock at reasonable prices. Dohm, Ltd., 167 Victoria Street, S.W.1. zzz-249

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Raw Material Available and Wanted (contd.)

" Perspex " offcuts. Required, large or small quantities. Please write J. E. Hoare (O.T.S.), Ltd., 134-144 High Street, S.W.17. 144-732

Accurate powders for ceramic, alloy, plastic, paint, etc., industries. Dohm, Ltd., Pulverizers, 167 Victoria Street, London, S.W.1. zzz-248

For sale, 1½ tons of Bakelite black moulding powder, ref. No. Grade A.X10894, packed in cwt. drums, material perfect condition, cost 1s. 7d. per lb., accept 9d. per lb. to clear. Sample sent on request.
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Perspex! Perspex!! Perspex!!! Official stockists for I.C.I. acrylic sheet. Sheets cut to your requirements. Fabrication and moulding specialists to the trade:—
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P.V.C. chips for sale at best offers, black 1,166 lb., ivory 1,850 lb., white 1,213 lb. Wilkinson Rubber Linatex, Ltd., Frimley Road, Camberley, Surrey. 144-x5353

Tubes in ivory casein. Large quantities at 36s. gross. 10 gns. per 1,000. Length 6¼ ins., outside diameter 1½ ins. or 1⅝ ins., wall thickness 1/16 in. Exchange Elec. Co. 41 Cheetham Hill Road. Manchester, 4. 146-976

Scrap. Why not let a well-established firm quote you for cellulose acetate, polystyrene and other thermoplastic off-cuts and scrap? Having best use for these materials, highest prices can be paid. Quotations on receipt of representative samples to M. H. Grist (Plastics), Ltd., 82-84 Brighton Road, Surbiton, Surrey. Phone, Elmbridge 4214. 144-21

D. H. Ridout and Son, Ltd. Reg. Office, 12 Stedman Road, Southbourne, Bournemouth. Phone, Southbourne 505.
Official stockists for I.C.I. acrylic Perspex, crystal and coloured, and " Crinothene " sheeting in all shades.
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Send for new stock list which contains numerous interesting items to opticians and manufacturers of finished plastic goods.
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.030-in. clear, 25 ins. by 56 ins., 20 sheet, 12s. 6d. sheet.
.030-in. white, 25 ins. by 56 ins., 60 sheet, 12s. 6d sheet.
SLATER AND WHEELER, LTD.,
" AIRLYNE " PRODUCTS,
ABERGELE, N. WALES.
144-11

Michael S. Stevens will collect P.V.C. cuttings and all other plastic scraps from your works. Ormond Road, Richmond, Surrey. (Richmond 0211.) 144-4

Raw Material Available and Wanted (contd.)

Perspex sheet (flat), brand new, 48 by 46 ins., 200 sheets ¼-in. thick, 250 sheets 5/32-in. thick. Will accept to clear 55s. per sheet and 45s. per sheet. Davidsons (M/C), Ltd., Hayes Yard, Garratt Street, Manchester, 10. Collyhurst 1610. 144-18

Offers wanted, 2-3 tons polystyrene crystals, white. Box P447, care of "Plastics." 144-17

For disposal, large quantity of urea formaldehyde moulding powder, white and blue in powder and granular form. Inquiries to Box P88, L.P.E., 110 St. Martin's Lane, W.C.2. 144-14

Black string-filled powder, one ton available for sale. Offers to: G. P. Chamberlain and Co., Ltd., Junction Works, Carmichael Road, South Norwood, S.E.25. 144-3

Transport acetate.
60 Thou, 500 lb. each green, blue and smoke, perfect as delivered by British Celanese; also
40 Thou. 1 ton transparent sheets, 56 ins. by 24 ins., 4s. per lb. to clear lot.
Large stocks of acetate in clear and colours, 3 thou.-40 thou.
Allans, 37 Farringdon Street, London, E.C.4. Central 5047. 144-2

For sale, Urea powders, 3½-tons each red and turquoise, ½-ton blue. Phenolic powders 10-tons walnut first quality, also 70 tons black, slightly contaminated with polystyrene (cheap). New acetate sheeting 20-30-1,000 in blue, orange and white. Details from Box P4317, care of "Plastics." 144-27

Wanted, thermoplastic moulding powders and moulding scraps, all kinds. Offers and samples to Box P4338, care of "Plastics." 144-24

SITUATIONS VACANT

None of the vacancies in these columns relates to a man between the ages of 18 and 50 inclusive, or a woman between the ages of 18 and 40, inclusive, unless he or she is excepted from the provisions of the Control of Engagement Order, 1947, or the vacancy is for employment excepted from the provisions of that Order.

Draughtsman required for the design department of a large plastic moulding concern in East London. Applicants should preferably have had some experience in the type of work indicated. Write, giving full particulars of age, experience, etc., to Box P444, care of "Plastics" 144-13

Foreman to Scandinavia. Scandinavian industrial concern wants experienced foreman possessing practical background of several years, able to supervise the manufacture of plastic flooring materials in sheets and tiles. Write in confidence, giving full details of past experience, references, etc., to Scandinavia. Box P446, care of "Plastics." 144-7

Sales representative for London area required by firm of plastics fabricators. Experience of thermoplastics preferred. Send full particulars to Box P442, care of "Plastics." 144-6

Expert with long-standing experience in extruding of cellulose-acetate wanted for abroad. Good prospects. Box P441, care of "Plastics." 144-1

Sales representative required by oil seal manufacturers, previous experience essential, excellent prospects. Apply Burtonwood Engineering Company, Ltd., Burtonwood, Warrington, Lancs. 146-977

Wanted, foreman for medium-sized injection moulding shop, London, toolmaker an advantage, drive and organizing ability essential, first-class man only. Box P4339, care of "Plastics." 144-25

SITUATIONS WANTED

Well-known toy manufacturers' sales manager requires change. Sales and managerial experience on high level, sound background and interested only in first-rate propositions. Inquiries in confidence. Box P4410, care of "Plastics." 144-x6076

Plastics technician, 35, seeks responsible post. Positions held include chief designer, technical manager. Experienced compression, transfer, injection, sheet forming, plant installations, development. Box P4411, care of "Plastics." 144-x6000

TIME RECORDERS

Factory time recorders. Service rental. Phone, Hop 2239. Time Recorder Supply and Maintenance Co., 157-159 Borough High Street, S.E.1. 149-544

WANTED

Advertiser wishes quotation for modern jute box cabinet in plastic. Address Box P449, care of "Plastics." 144-x6426

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Spray and brush waterproof inks, all colours, for acetate, acrylic and P.V.C. plastics. Samples from Lakeland Ink Co., Barrow-in-Furness. 145-0636

English town crests. Ideal for Perspex, etc. Will double your sales; 6s. per dozen. J. E. Hoare (O.T.S.), Ltd., Dept. P1, Marion Parade, High Street, S.W.17. 144-733

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Engraved name plates, scales, dials, etc., supplied. Tickets and Co., Box 2, Silver Street, Leicester. 153-824

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Trade Mark Protection Society,
12 Church Street, Liverpool. 154-935

Moulds, hard chrome, seven-day service. Specialists in all forms of chromium, nickel plating and polishing. Industrial Plating and Research Co., Ltd., The Trading Estate, Cowley Mill Road, Uxbridge, Middlesex. Uxbridge 2858. 144-0821

Plastics engineer can undertake development, plant layout; expert mould designer; experienced moulding and forming all types of plastics using latest techniques; inquiries invited. D. Allan, 117 Queen's Walk, S. Ruislip, Middlesex. 144-x6000

Plastic cuff clips, pantentee wishes to contact interested manufacturers. Box 25, Smiths Bookstall, Central Station, Exeter. 144-10

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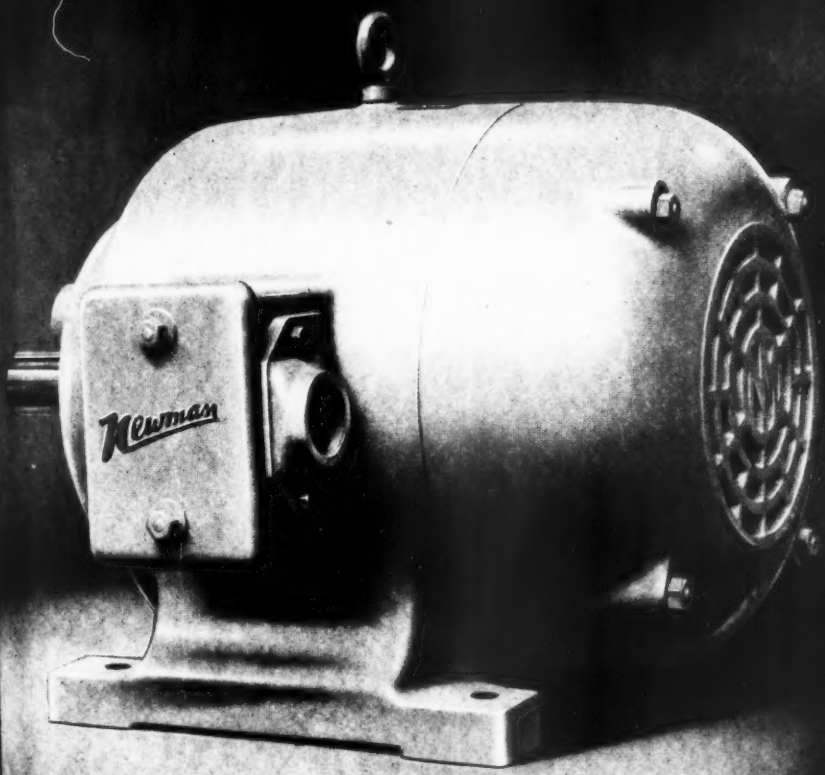

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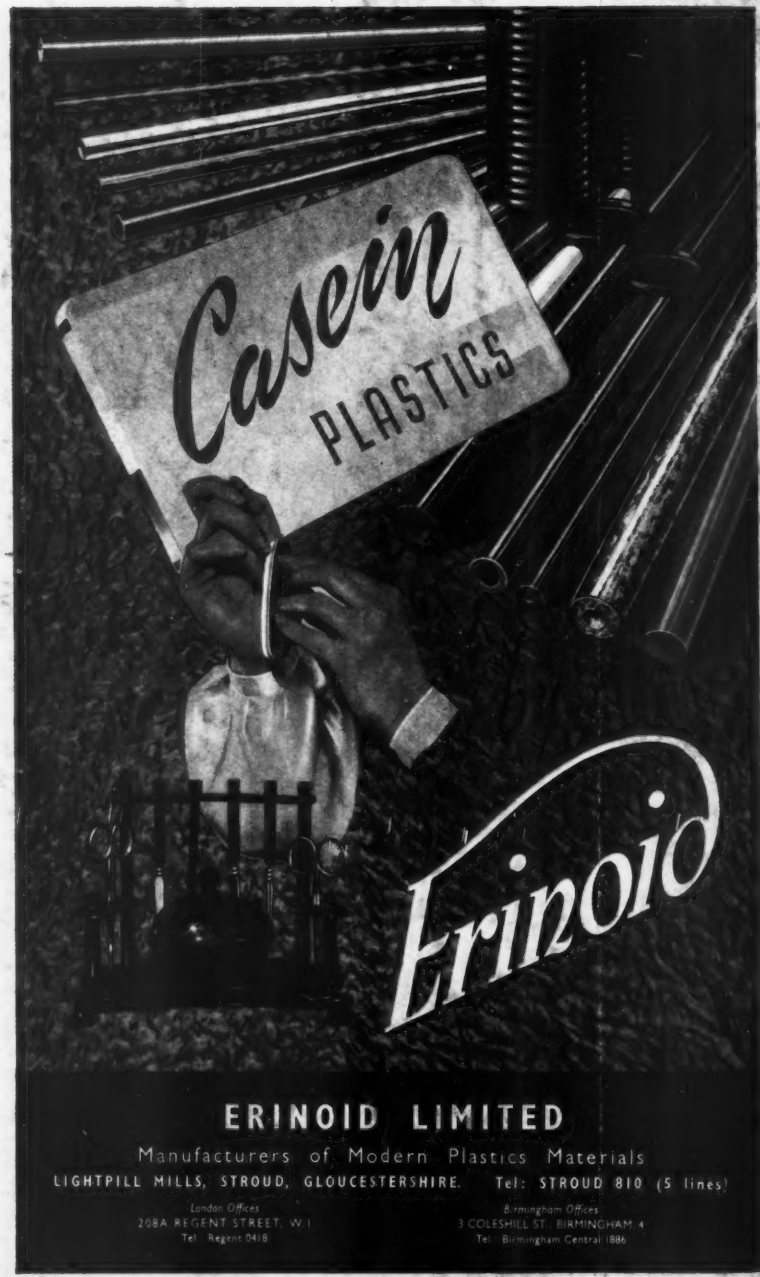

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